SCIENTIFIC AMERICAN

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Oil was struck at 2,300 feet depth. The stream rushed forth with such violence that it blew off the top of the derrick and rose over 300 feet aoove the ground, falling in a widely scattered shower of "oil rain." The well has continued to pour forth oil at the rate of 42,000 to 45,000 barrels per day, forming the huge lake seen in the foreground of the picture.

THE LAKEVIEW GUSHER, CALIFORNIA.—THE MOST PROFITABLE OIL WELL IN THE WORLD.—[See page 419.]

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NEW YORK, SATURDAY, MAY 21st, 1910.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

NEW SKYSCRAPERS FOR OLD.

UNDER modern industrial conditions, things are done in a big way and often with a strong dash of the spectacular. But the city dweller, albeit he is daily confronted with the unusual and the unexpected, must confess to some measure of surprise on learning that a modern skyscraper 300 feet in height, and but a dozen years old, is to be torn down to make way for a new structure which is to be several stories higher, and—"more up-to-date," if you please. To the conservative European, the ruthless demolition of a building that must have cost over a million dollars, and is still entitled to be called new, will appear, no doubt, as another instance of our national vice of extravagance. But it is not so. The Gillender building is being razed in accordance with a certain industrial doctrine, which has been found to give most excellent economical results, namely, the doctrine of the "scrap heap," according to which, we believe, and have proven in a thousand ways, that so soon as the march of improvement or development renders it certain that there is more profit in "scrapping" an existing machine, plant, or building, and replacing it by another more efficient or of greater capacity, it is a matter of sound business policy to send that machine to the "junk heap" or turn the "wrecking gang" loose upon that building.

The policy is purely utilitarian—brutally so, if you like—a mere question of dollars and cents; but it is a good business policy nevertheless, and, in reality, has been one of the most powerful factors in bringing about the present phenomenal industrial development of the United States.

Your old-world engineer or architect, with perhaps a stronger flavor of sentimentalism, hesitates to sweep a faithful servant so remorselessly out of the way. He will point with pride to his forty-year-old locomotive with its million-mile record of service; and he will add wing to wing and another story or two to a building, if this be possible, rather than raze to the foundations and build from the ground up. It is a case of each to his choice; though there are not wanting many indications that British engineers are beginning to realize the value of the scrap heap, and apply the principles which it implies in the development of their industrial enterprises.

The Gillender building, which stands at the northwest corner of Nassau and Wall streets, in this city, is a sixteen-story, steel-frame, office building, which was completed in 1896. The construction was first-class, the foundation being put down by the pneumatic process, and the steel frame thoroughly braced to resist wind and racking strains. From street to cornice the sixteen stories extend for a height of 241 feet, and the picturesque three-story tower above brings the total height to about 300 feet. The exterior of the building is faced successively with granite, limestone, and terra cotta. Examination has shown the structure to be in as good condition to-day as when it was put up, and engineers and architects will be greatly interested as the steel frame is uncovered, to observe how much, if any, oxidation of the inclosed steel work has taken place. In all probability, judging from the condition of the steel work of other composite buildings which have been demolished, such, for instance, as the Pabst building, removed a few years ago to make way for the New York Times structure, no rusting will have occurred that is worthy of mention. The removal of the Gillender building, while it will not probably bring to light any new facts regarding the behavior of inclosed steel columns, will strongly establish the conviction (should everything be found intact) that if the steel work be thoroughly painted at the mill, at the shops, and before it is inclosed in the building, it is absolutely proof against rusting and will remain intact and serviceable as long as the inclosing walls and roof endure.

Outside of rusting, there is no other known agency that tends to shorten the life of the steel frame of the modern skyscraper. Exploded long ago was the theory of the fatigue of metal. Simple statical stresses, or even dynamical stresses of frequent repetition, do not necessarily shorten the life of steel structures. It is only when these repeated stresses approach the elastic limit, that the strength of the metal is imperiled—and in the modern skyscraper no such conditions exist. Certain imaginative magazine writers to the contrary notwithstanding, the visitor to New York five hundred or a thousand years hence will find the skyscrapers of to-day in perfect condition; provided, of course, that the doctrine of the scrap heap above referred to has not called for their demolition.

OUR NAVY AS A NATIONAL INSURANCE.

AT the recent launch of the "Florida," as the great ship was starting down the ways, one of the crowd was heard to remark, "What a shameful waste of public moneys it seems, when we think that this $10,000,000 ship may never be employed in the work for which she was built, and that if she ever gets into a fight, she may be sent to the bottom within a few minutes of the opening of an action." The remark was characteristic of much that is being said and written on the subject of the wastefulness of modern armaments. Taken by itself, it would seem to be convincing; but if we look at the question broadly, and with that just sense of proportion which is necessary to a correct estimate of the value and meaning of things, we shall see that such talk is the purest sophistry. The costliness of a battleship must be judged in relation to what it stands for and the work which it is intended to do. In the last analysis, the "Florida" is one element in an economical system of national insurance, designed to protect both the lives and the property of the ninety millions of inhabitants of the United States.

The true test of the question of the extravagance of naval expenditures is to determine the ratio that they bear to the money value of the property which they protect. The following estimates of expenditures, which have been furnished from Washington, show that the first cost of the ships of the navy, as they float to-day, is roughly $400,000,000, while the current annual expense of their maintenance is about $44,000,000. The cost of maintenance last year, including pay of officers and enlisted men of the navy and marine corps, pilot dues, provisions, clothing, ordnance, equipment, medical and machinery stores, including coal, water, and other incidentals, amounted to nearly $38,000,000. The cost of repairs to the hulls, machinery, and equipage of the vessels amounted to more than $6,000,000, making the combined expense of preserving peace on our shores nearly $44,000,000.

The amount involved covers the expenses of all the various types of our ships of war, which include battleships, armored cruisers, cruisers, scouts, the torpedo flotilla, monitors, gunboats, supply ships, hospital ships, colliers, converted yachts, tugs, and receiving ships.

As an example of the heavy expense of maintaining a big ship of war, we may take the battleship "Connecticut," which was the flagship of the Atlantic fleet during the last year. The pay of the officers and enlisted men of the navy and marine corps attached to the vessel and the expenses incidental thereto amounted to nearly $800,000. This did not include the cost of the necessary repairs.

The home fleet, or the vessels attached to the Atlantic side of the country, last year consisted of sixteen first-class battleships, which were divided as follows: six of the "Connecticut" class of 16,000 tons, five of the "Georgia" class of 14,500 tons, the "Idaho" and "Mississippi" class of 13,000 tons each, the "Missouri" and "Ohio" of 12,500 tons each, and the "Wisconsin" of 11,500 tons. The average cost of keeping a vessel of the "Georgia" class in commission and on active service, which did not include repairs, was nearly $680,000, while that of the "Idaho" and "Mississippi" class was nearly $530,000 each. The average cost of the "Missouri," "Ohio," and "Wisconsin" ran close to the $600,000 mark for all three. While these figures will vary for the same ships in different years, the cost of maintenance will not change much from year to year for the same class. The total cost of keeping these sixteen battleships of the Atlantic fleet in active service last year amounted to more than $10,500,000. It costs just about as much to keep an armored cruiser in active service as it does a first-class battleship, as is evidenced by the fact that the ten armored cruisers which were in commission last year cost the United States $7,000,000. Of these cruisers in commission, six were of the "West Virginia" 13,680-ton class, and the other four of the "Montana" 14,500-ton class.

With the increase in size of the battleships, there is a corresponding outlay for pay of the personnel, stores, maintenance, and repairs. The latest battleships to be placed in commission, the "Michigan" and "South Carolina," each of 16,000 tons displacement, will require crews of more than 50 officers and more than 800 men each. After these are ready, the "Delaware" and "North Dakota," each with 20,000 tons displacement, and each requiring 53 officers and 878 men, will be placed in commission. These will be followed by the "Florida" and "Utah," each of a normal displacement of 21,835 tons, and each requiring 60 officers and 954 men, while the 26,000-ton "Arkansas" and "Wyoming," contracted for last fall, will each require a crew of 85 officers and over 1,000 men.

Now there is no denying that these expenditures, considered by themselves, are enormous; but when they are measured up against the vast national wealth, in whose interest they are incurred, they sink into positive insignificance—and our navy is seen to be the least costly, as it certainly is the most effective, institution in that scheme of national government, which is designed to protect the lives and property and to further the happiness of the people of the United States.

If the above seems to be a strong statement, it is capable of easy proof. The latest estimate of the wealth of the United States available in the Bureau of Statistics is that of 1904, made by the Census Bureau, which put the total for that year at $107,104,211,917, or $1,310 per capita. The 44 millions which the navy cost last year may be regarded as the cost of insurance against damage and loss of that 107 billions; and, as such, it represents a premium of only four one-hundredths of one per cent. If we include the interest on the capital cost (400 millions) of the existing fleet, the premium is only six one-hundredths of one per cent, while the cost of the "Florida" (10 millions) which loomed so large in the eye of the captious critic at her launching, dwindles to one one-hundredth of one per cent of the wealth of the country.

THE UTILIZATION OF SOLAR HEAT.

IF the heat of the sun's rays were entirely converted into mechanical energy, it would furnish more than two horse-power for each square yard of surface exposed to the sun; but in practice it is difficult to utilize solar heat. Attempts were made in France by Mouchot and Tellier in 1871 and in Sweden by Ericsson in 1883. Mouchot and Tellier used a conical mirror to concentrate the rays upon a boiler containing water or other volatile liquid, but the mirror was costly and it gave only one horse-power for 12 square yards of reflecting surface. Tellier, in 1885, caused the sun's rays to be absorbed directly by a lamellar boiler, containing a thin layer of water or more volatile liquid, such as ammonia or carbon disulphide. The same method has been recently employed by Shuman and Wiltsee in America. Shuman employs the steam generated to drive a low-pressure turbine. The boiler is constructed upon the principle of a greenhouse, i. e., on the property which glass possesses of transmitting the sun's rays, but stopping the return of thermal radiation from the interior. The boiler is a large vat coated with pitch and containing a layer of water three inches deep. An apparatus of this sort was operated in Philadelphia in 1907-1908.

Wiltsee also employs a lamellar boiler covered with glass, but the water heated in this boiler is used to vaporize the more volatile liquid, ammonia or sulphur dioxide, the vapor of which performs a closed cycle. In California an apparatus of this kind, with a boiler of 120 square yards of heating surface, furnished a mean power of 15 horse-power. Wiltsee estimates the cost of the apparatus at about $1.50 per square yard and calculates that it should absorb, at the 34th parallel of latitude, about 4,000 calories per square yard per day. With these data about 50 square yards would furnish one horse-power and would cost $80. For a large plant of 400 horse-power, however, the total first cost per horse-power would be doubled. The cost of operation is about 3/5 cent per horse-power-hour.

In experiments made at the agricultural station of Lausanne, Switzerland, for the purpose of determining the effect of potash fertilizers upon natural meadows, two neighboring fields, having almost identical soils of glacial marl, showed a marked difference in effect and, very curiously, the soil of the field that had yielded the larger crop was found, after harvest, to contain more potash than that of the other field. This remarkable result has been traced to the influence of drainage. The better drainage of the field which yielded the larger crop promoted the circulation of air and water in the soil, favored the assimilation of soluble nutriment, and caused the roots to extend to a greater depth and utilize a larger volume of earth. This example shows that the fertility of a soil cannot always be determined by chemical analysis alone.

ENGINEERING.

Reinforced concrete continues to widen the range of its application. The Western railroads are preparing to build this summer long stretches of reinforced concrete snow sheds. These will not only be stronger than the present timber structures, but they will be entirely safe from the menace of fire.

The independent gasoline-driven railroad motor car, which we have frequently illustrated in this journal, is growing in favor. A new car, 70 feet in length, recently left the shops at Omaha for the Buffalo, Rochester and Pittsburg Railroad. This is the seventy-fourth car of the type to be turned out from these shops, and it is the sixth car to be built for service east of the Mississippi River.

The ever-increasing weight of Western passenger trains is being met by a steady growth in the size and power of the locomotives. The Chicago, Milwaukee & St. Paul have recently turned out of their shops two types of six-coupled simple locomotives, with cylinders 23 inches by 28 inches, one of which has 79-inch drivers and a tractive effort of 31,900 pounds, and the other 69-inch drivers and a tractive effort of 26,500 pounds.

An electrically-operated pile driver is described in a recent number of the Electrical Review and Western Electrician. The apparatus, which is of English make, is provided with a revolving frame and swivel leaders. Instead of a mechanical device for gripping the monkey, an electro-magnet is used, the top of the monkey being planed off smooth to provide a good contact surface. An electric motor is used for operating t hoisting crab. The circuit of this motor includes the magnet, and the switch for the latter is attached to the crab.

An important paper on oils used for switches and transformers was recently read at the Manchester session of the Institution of Electrical Engineers. It was pointed out that very little attention has been paid to the quality of the oil used in this way, and that any impurity in the oil would reduce its resistance to a flow of electric current, also that the specific resistance at different temperatures varies with the grade of the oil. Careful investigation of this subject was urged with a view to obtaining oils of standard resistance values.

In a recent lecture before the Engineers' Club in New York, Mr. Elmer A. Sperry, the electrical engineer, demonstrated with a working model the value of his "active" gyroscope. If the ordinary, or "passive," gyroscope be applied to ships, the vessel must roll some 2½ degrees before the counteracting influence is exerted. In the new type the least tendency toward a roll sets in operation a governing device, consisting of a smaller gyroscope, which starts the larger gyroscope, and thus secures an instant and absolute stability. Mr. Sperry believes this new type will provide the gunner with a perfectly stable platform.

Amcrica will be represented this year in European yacht racing by the large and powerful two-masted schooner, "Westward," which has been built by Herreshoff for A. S. Cochrane of the New York Yacht Club. The "Westward" is the largest American racing schooner yet sent across the Atlantic. She is of 197 tons gross, as compared with the "Ingomar," of 142 tons, also built by Herreshoff, which a few years ago made a brilliant record in English and German waters. She will meet the big German schooners "Meteor" and "Germania," and probably one or two English-built schooners of less size, but of proved speed and ability.

According to A. A. C. Swinton, the first flight of a model aeroplane propelled by steam is to be credited to the Hon. Charles A. Parsons of turbine fame, who in 1893 built an aeroplane with two 11-foot wings and a tail, and drove it with a steam engine whose cylinder was 1¼ inches diameter by 2 inches stroke, steam being supplied by a boiler 2½ inches diameter by 14 inches long, in which steam was generated at 50 pounds pressure by a spirit lamp. The whole apparatus, including aeroplane, engine, and fuel, weighed 4¾ pounds, and it flew for distances of 100 yards at a height of 20 feet, coming down only when the steam pressure fell.

We have been favored by Mr. George Westinghouse with the following particulars of his new reduction gear high-speed marine turbine. The rotor complete will weigh about 1½ pounds per horse-power in sizes of from 3,000 to 1,500 horse-power. The number of blades of all kinds in a turbine of from 7,500 to 10,000 horse-power will be slightly under 15,000. The total weight of the turbine with rotor will not exceed 7 pounds per horse-power, and the weight of the gearing will be under 8 pounds per horse-power. The effect of this reduction of weight is seen in the new naval collier, No. 8, which will carry 200 tons more coal than if she were driven by reciprocating engines. A saving of an additional 200 tons will be realized as the result of the greater economy of the plant in fuel consumption.

ELECTRICITY.

The conditions under which a street lamp should prove its efficiency are very different from those which govern the indoor lamp. This was brought out clearly in a recent address before the New York Section of the Illuminating Engineering Society by Dr. Clayton H. Sharp. He pointed out that while in the building it is advantageous to have much of the light of a lamp pass upward and be reflected by the ceiling, in the case of a street lamp this would be a great fault, for the vertical rays would be lost. Only those rays that are cast directly downward and horizontally up and down the street can be utilized. For this reason he has devised a reflector consisting of a pair of parabolic mirrors arranged to throw the rays in the direction of the steet, so that practically all of the light will be used to best advantage. Thus, in place of having the street lighted in spots, as is now the case, a more continuous illumination is provided.

The block signal systems of steam railroads have hitherto been operated with direct current from storage batteries. This has always been an expense, owing to the inconvenience and difficulty of maintaining the storage batteries. In recent times trolley roads have been using an alternating current signal system, which has been found to work very satisfactorily, and the announcement has just been made that the Pennsylvania Railroad is about to install an alternating current block signal system on the line between Dixon, Ohio, and the Grand Rapids and Indiana Railway. This is probably the first instance of the use of alternating currents for steam railroad signaling purposes, and if found satisfactory should do much toward extending the use of block signals on lines where the direct-current system is impracticable.

In an article appearing in a recent number of the Electric Railway Journal, some very interesting conclusions were arrived at concerning the question of the cost of a street-car ride. The nickel surrendered for, say, a three-mile ride in a street car is the very cheapest investment a man can make for covering this distance. Certainly any other method of transportation would be far more expensive, and even the man who walks to his work, if he is earning 15 cents per hour, would consume at least 10 cents' worth of time instead of the 5 cents spent on the street car. In addition to this, the nickel surrendered to the street-car company is an insurance to him against accident, while if he rides in an automobile, or even if he walks to his work, he would be obliged to pay all damages in case of accident. Furthermore, the time spent on the street car can be employed in reading business documents or doing other such work.

In view of the recent agitation in favor of using electric headlights on locomotives, the experiments along this line by Prof. Benjamin, of Purdue University, are most interesting. Prof. Benjamin has found much to be said against the electric headlight. Not only does the strong beam of light blind engineers on locomotives coming from the opposite direction, but it also has a peculiar effect of producing false signals. In one of his experiments the light of a green signal was extinguished, but when the beam from the electric headlight fell upon the green roundel, it was powerful enough to reflect a green light, which appeared to the engineer to be a caution signal. This effect persisted until the engine was within four hundred feet of the signal. On the other hand, in favor of the electric headlight it has been pointed out that obstructions on the track are readily seen far enough off to permit of stopping the train before they are encountered. Furthermore, on a single-track line, the presence of a train may be detected at a long distance off, and head-on collisions may thus be prevented.

Considerable attention has been directed of late to the injurious effect of certain rays of electric lamps upon the eye. A very interesting communication upon this subject was recently presented by Dr. Stockhausen before the Illuminating Engineering Society of London, and he pointed out that an excess of radiant energy, no matter what its wave length, is injurious. Hitherto it has been supposed that the red and infra-red rays, on account of their heat value, are very injurious to the retina, but Dr. Stockhausen does not believe that under ordinary conditions the effect of these rays is very disastrous. Certainly, in sunlight, these rays may be found in large quantity. The best rays for the human eye are the yellow-green rays. The rays from blue to deep violet do not appear to produce serious effects, and even the rays in the ultra-violet section of the spectrum do not do very much damage. The really injurious rays appear to be those which belong in the extreme ultra-violet section. These rays are not found in ordinary sunlight, but appear in the light produced by quartz-inclosed mercury vapor lamps. As ordinary glass is opaque to these rays, it is a simple matter to avoid them.

SCIENCE.

A telegram has been received at Harvard College Observatory from Prof. H. H. Campbell, director of the Lick Observatory, stating that "Frank McClean cables from Hobart, Tasmania, steady rain, eclipse invisible."

A new inflammable celluloid has been patented by Prof. A. Gautier. The chief feature of the process is the employment of an ether silicate instead of pure ether, which is ordinarily used with alcohol as the solvent in the agglutination of nitrocellulose fibers by means of camphor.

The University of Paris and the Pasteur Institute have been authorized to conduct jointly a laboratory of radio-activity located in Paris. This new laboratory will be divided into two sections, one of which is reserved for scientific researches under the direction of Madame Curie, while the other will be devoted to medical applications of radio-activity, and is placed under the direction of the Pasteur Institute.

What does "gold-filled" mean? Probably most people who buy gold-filled watches fancy that they are mysteriously impregnated with gold. As a matter of fact, the term is misleading. Gold filling consists in taking two sheets of gold, between which is placed a section of solder-coated base metal. This metallic sandwich is heated and pressed, so that the three parts are welded together, with the gold outside.

Dr. E. E. Barnard of Yerkes Observatory informs us that despite the haze and clouds of the early morning of May 7th, 1910, he obtained fair photographs of Halley's comet. A tail about 20 deg. long appeared on the photographs. To the naked eye it was only 17 deg. or 18 deg. long. The head was of the second magnitude. On one picture the tail showed separately in three strands, some five or six degrees from the head. The comet was a beautiful object on the mornings of May 4th and 5th.

In a recent bulletin issued by his observatory, Mr. Percival Lowell describes his newly-discovered Martian canals. These new canals are two in number, and were discovered on September 30th, 1909, to the east of the Syrtis Major, where no canals had ever previously been seen. They were most conspicuous. Not a trace of them could be found in the record drawings of August, July, June, or May when this part of the planet was depicted, nor could any trace of them be found in the records of previous years. Mr. Lowell admits the possibility that the phenomenon might be one that could have been seen before, but was not, yet the possibility of error seems excluded by the size of the canals in question. He regards the evidence as strong that the canals are not simply new to us, but new to Mars. Measurement of their dimensions shows each of them to be a thousand miles long and some twenty miles wide. The Canyon of the Colorado would be a secondary affair in comparison.

Light is of very great importance to algæ growing on the sea bottom, and in their struggle to obtain light the plants assemble in structures of several stories. The algæ of the genus *Laminaria* adhere to the rocks by means of disks. The wounds made in the plants by the attacks of animals become covered with a protective secretion, in which the countless spores which the sea water contains become entangled and grow. This layer of epiphytes is covered in a similar manner by a second layer of plants, or of sessile animals, the shells of which are again covered with algæ. In addition to these variegated structures, in which saprophytes and parasites have their place, fragments of algæ, which have been torn by winds, currents and animals, take root upon other algæ and form structures of several layers. For example, the delicate *Ectocarpus* grows on *Laminaria*, and is soon covered by the broad root disks of *Rhododymenia*, which are sufficiently transparent to transmit to the *Ectocarpus* sufficient light for its development.

The mineral waters of Vichy, Clermont-Ferrand, Mont Doré and Spa contain fluorescent substances in very minute quantities. The quantity of fluorescent matter often increases with the temperature of the water and diminishes as the amount of solid residue increases. At Spa, the amount of fluorescent matter has been diminished by improvement in piping. The largest proportion is found in waters containing tarry constituents. These results are of practical interest in connection with the piping of mineral springs. Nearly all natural waters, whether potable or contaminated, contain organic substances which are already fluorescent and others which become fluorescent when the water is heated to 266 deg. F. for half an hour. The development of fluorescence is promoted by the addition of five per cent of ammonia. All such waters exhibit increased fluorescence when they are heated, but this change is not produced by heating the water of a properly piped mineral spring, because this water has already been exposed to a temperature of at least 266 deg. F. in the earth, and a second heating does not affect the fluorescence.

COMET NOTES.

The Lowell Observatory has issued a bulletin entitled "Preliminary Notes on Photographic and Spectrographic Observations of Halley's Comet." The observations consist principally of direct photographs of the comet and photographs of its spectrum as seen at Flagstaff. Halley's comet before April 18th had shown no very striking changes, except in the divergence or separation of the lateral streamers. Negatives obtained on April 25th and 27th show marked changes in the form of the tail. On the 25th the tail, at a short distance from the head, divided into three narrow streamers, a central ray and two symmetrical side branches. On photographs made on the following morning, the tail was again quite narrow and straight. On the 27th it was again branched. The most remarkable changes noticed at Flagstaff in the comet's tail were observed on photographs made on April 30th and May 1st. On April 30th the tail had completely changed in form. The more or less bilateral symmetry had entirely disappeared. The plates of May 1st show for a distance of about 70 deg. a tail well defined with a gentle curvature, but beyond this point faint and diffuse. The outer parts of the tail on the last two plates have the appearance of having been acted upon and shattered by some rather sudden and disturbing disintegrating force. The comet's nearest approach to Venus occurred about this time. The question naturally arises, could the planet have been the disturbing influence? Comparisons of the disappearance of the comet's tail for some days before and after this event may tell us something.

The great square of Pegasus acted as a splendid "finder" both for the comet of 1910 A and for Halley's comet. This mutual association of the two comets with Pegasus affords a good example of one of the chief difficulties experienced by those astronomers who have endeavored to trace Halley's comet amid the mass of brief and very general records of comets in ancient chronicles.

It is unfortunate that the chance of capturing a sample of the tail of Halley's comet was not seized. The passage of the earth through a comet's tail is so rare an occurrence that no opportunity should be missed. In the April number of the Bulletin de la Société Astronomique de France, C. E. Guillaume suggested the liquefaction of a large quantity of air which could afterward be treated by fractional distillation, and possibly some cometary matter recognized. He pointed out that very minute quantities of the rare gases, such as krypton and argon, are thus secured from immense volumes of air, and that it is now possible to liquefy 1,000 cubic meters of air per hour. It is just possible that by this means a chemical study of the comet might become a by-product of an industrial operation.

An investigation of Encke's comet by Dr. Backlund shows that the acceleration of the mean motion of that body between 1895, 1901 and 1904 was not constant. Dr. Backlund suggests that the resistance which would explain the phenomenon is a meteoric swarm in the neighborhood of perihelion, and that the decrease of the acceleration must be attributed rather to the diminution of the density of the resisting medium than to changes in the comet itself. Dr. Backlund also discusses the comet's fluctuations in brightness, but offers no explanation.

The passage of the earth through the tail of Halley's comet has led Flammarion to suggest that if there is any palpable material at so great a distance from the head, it might be possible to measure the minute rise of temperature produced by the earth as it rushed through the tail at the rate of 48 miles a second.

Although comet A 1910 has sped away, its peculiarities are still the subject of astronomcial comment. Thus Dr. Wolf comments upon a conical mass of material extending from the base of the coma toward the sun, quite different from anything seen in previous comets, and having the appearance of a miniature zodiacal light.

It was to be expected that the apparition of Halley's comet would not remain without its effect upon the more ignorant peoples of the world, even though this

PHOTOGRAPH OF HALLEY'S COMET TAKEN BY DR. E. E. BARNARD ON MAY 5, 1910

is the twentieth century, and the days of superstition are supposed to have passed. Reports from China state that the comet was used as an omen to inflame rioters in disaffected districts. To be sure, the authorities tried to counteract these attempts by exhibiting pictures of the comet with an account of its previous appearances without ill effects, in order to reassure the natives. This Chinese situation finds its counterpart in Europe. The suicide of a Hungarian farmer "on account of Halley's comet," as the newspapers have it, is followed by a report from Odessa that in Southern Russia there is a veritable popular terror which is being exploited by unscrupulous persons for the purpose of obtaining money for special prayers, etc.

Observations of Halley's comet made in Harvard College Observatory on the morning of May 6th lead to the following results: The brightness of the nucleus of the comet was measured by Prof. Wendell with the 15-inch equatorial, with the resulting magnitude 7.06. The nucleus was, therefore, distinctly fainter than on April 27th, when its magnitude was 6.01. The total light of the comet was greater, being estimated by Mr. Campbell as magnitude 2.3. Three photographs were obtained by Mr. King which showed a well-defined nucleus. A long tail was shown, which was bifurcated.

THE ACCIDENT TO THE "ZEPPELIN."

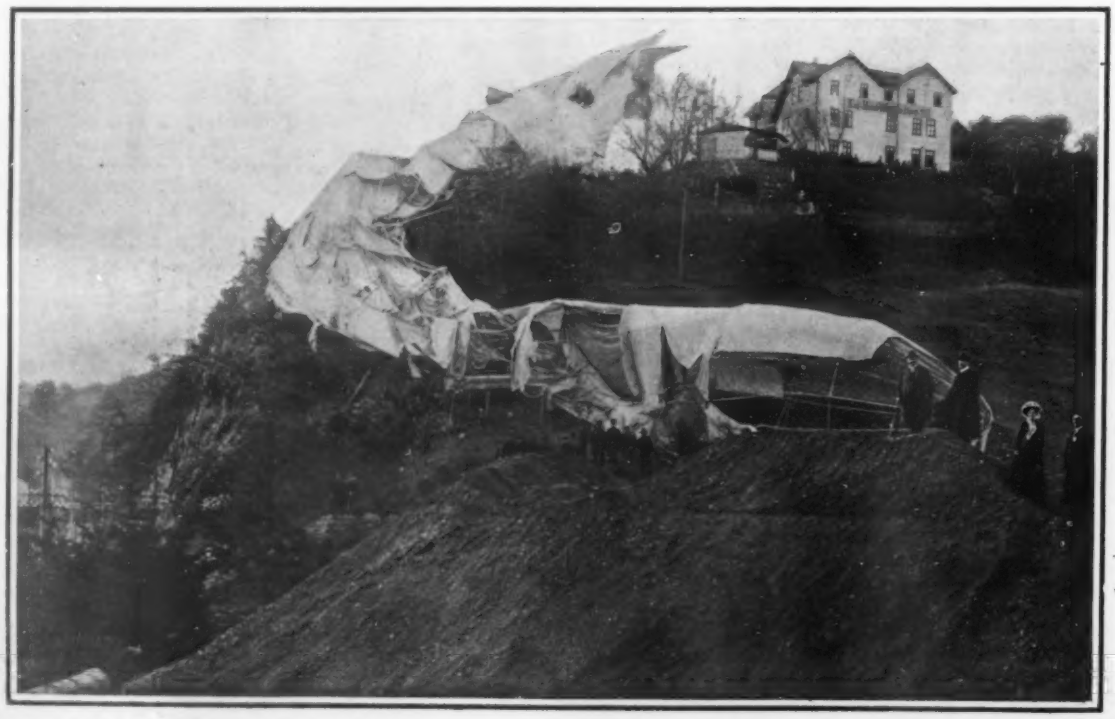
The recent destruction of the "Zeppelin" airship again drives home the inherent defects of the rigid type of airship. While journeying from Homburg to Cologne, it was necessary to anchor the airship in an open field. On April 25th, at 1 P. M., after the vessel had received a new charge of gas, it was torn from its anchor by a storm, and driven away in a northwesterly direction. The airship came down at Webersburg in the vicinity of Weilburg on the River Lahn, and was totally destroyed. Two companies of soldiers were unable to hold the vessel against the terrible storm. In order to prevent a catastrophe, it was necessary to order the soldiers to release the airship, which immediately rose to a height of 700 feet, and was driven away in the direction of Weilburg. At 20 minutes past one the airship was sighted from Weilburg. Suddenly, probably caused by a downward gust, the vessel was forced down into the Lahn valley. In the Lahn valley, where the storm raged violently, the wind blew the vessel broadside and pressed it down to the earth. The nose dipped almost into the Lahn, which winds through the valley. Then the bow of the "Zeppelin" was caught in the telegraph wires which run along the railway. The metal frame was twisted. Trees were bent and telegraph poles were torn down, and with a frightful noise the wind hurled the enormous gas bag against the side of a hill and forced it into the trees. Another gust of wind then threw the lower portion of the airship across the hill. Aluminium parts, yards of balloon cloth, and steel rods lay in a tangled mass.

The catastrophe of Weilburg is the fourth sustained by dirigible airships. The first was that of the French dirigible "La Patrie," which during a trial at Verdun on the 29th of November, 1907, had to land in the vicinity of Suesnes. The next morning, the wind changed to a howling hurricane. The soldiers who were in charge of the airship were compelled to release the ropes in order not to be carried away. In a few minutes the "La Patrie" had vanished, and was never seen again.

The next great catastrophe destroyed the "Zeppelin IV.," while Count Zeppelin was on his famous 24-hour record trip of the 4th and 5th of August, 1908. On the return journey, about ten kilometers from Stuttgart, Count Zeppelin was compelled to alight at Echterdingen to make repairs. Even before it was possible to cure the defects in the motor, which had caused him to come down, the airship was destroyed. To this day the actual cause has not been discovered. The "Zeppelin" caught fire and was burned up in a few minutes.

The next catastrophe affected the French dirigible "Republique." The destruction of the "La Patrie" and the

(Concluded on page 427.)



By courtesy of L'Illustration.

THE WRECK OF THE ZEPPELIN AIR SHIP AT WEBERSBURG.

THE THORNE-BAKER TELE-PHOTOGRAPHIC APPARATUS

AN INSTRUMENT FOR TRANSMITTING PICTURES WITH AND WITHOUT WIRES.

On the evening of May 11th, Mr. T. Thorne-Baker delivered a lecture before the New York Electrical Society, in which he explained a new tele-photographic apparatus, of his invention. The apparatus is to be experimentally tried out in transmitting newspaper pictures between New York and Boston. It has been so used by the Daily Mirror of London, between Paris and London, and Manchester and London since July, 1909. With some modification, it can be adapted to the wireless transmission of pictures.

Mr. Thorne-Baker's apparatus employs no selenium cells and prints the records electro-chemically. A print is made from a photographic negative in sensitized fish glue on lead foil. The print is made in the usual way, and the parts not acted upon by light are washed away, as in the gelatine process of photography. This impression is wrapped around a drum somewhat similar to the drum of an Edison phonograph. The receiver consists of a similar revolving metal drum, over which a platinum stylus traces a helical line on a paper impregnated with some colorless electrolyte, the nature of which is not revealed. Whenever the transmitter of the stylus touches a clear part of the metal foil, current flows to the receiver, and a black or brown dot or mark appears on the chemical paper. The accompanying diagram illustrates the general arrangement of the apparatus.

The lead-foil picture is broken up into thin and thick lines with spaces intervening. The stylus touches the lead base or the fish-glue lines, and the time of contact depends upon the width of the line. Hence the width of the lines determines the periods of the line currents.

The apparatus is used over a telephone line, the circuit being closed by the two styles S_1 and S_2, with two batteries B_1 and B_2, and the split resistance W_1, W_2 of 1,000 ohms, in shunt. The variable condenser K is shunted across the variable contacts of the resistances, and the currents used to sweep out the residuary charges are regulated with the aid of the resistances W_1 and W_2. These line currents flow through the chemical paper on the drum, but the pole of battery B_1 connected with the style S_2, is of opposite sign to that of the line unit connected with it. When the leakage on the line is great and evenly distributed, less reverse current is required from the balancer (a device employed to wipe out residuary currents from the line in the way frequently made use of in duplex telegraphy). By increasing the voltage of the reverse batteries B_1 and B_2, considerably greater contrast can be obtained in the pictures. The finer the half-tone screen employed in splitting the half-tone up into lines, the higher must be the voltage.

In all tele-photograph apparatus, the problem of synchronism is one that has always bothered the inventor. The best arrangement is that of Korn, whose system has been adopted by most recent designers, as well as by Mr. Baker. The motors, driven through storage batteries at about 3,000 revolutions per minute, are geared down for the drums to 30 revolutions. The speed of each motor is regulated by resistance in series to the field, and the speeds are observed with the aid of vibrating reed frequency meters. A set of tuned steel tongues is fixed in front of a magnet which is fed with alternating currents from slip rings on the motor. Each tongue has a different period of vibration, and when the alternations in magnetization correspond with the period of one tongue, that tongue will vibrate. The receiving drum is driven somewhat more quickly than the transmitting drum, and, therefore, completes its revolution somewhat before the transmitter. It is then stopped by a steel check. When the transmitting drum has completed its turn, a fleeting contact comes into play; a reverse current is sent to the receiver, which flows into a relay actuating the electro-magnet by which the check is removed. Thus, whatever lag there may be is limited to one drum, and the drums are always re-started in unison.

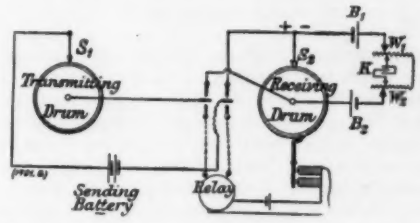


Fig. 1.—General arrangement of the apparatus.

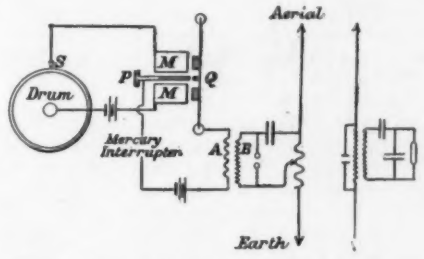


Fig. 2.—Apparatus for transmitting pictures wirelessly.

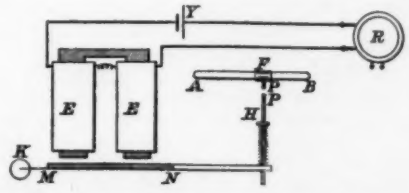


Fig. 8 –Relay employed in the wireless apparatus.

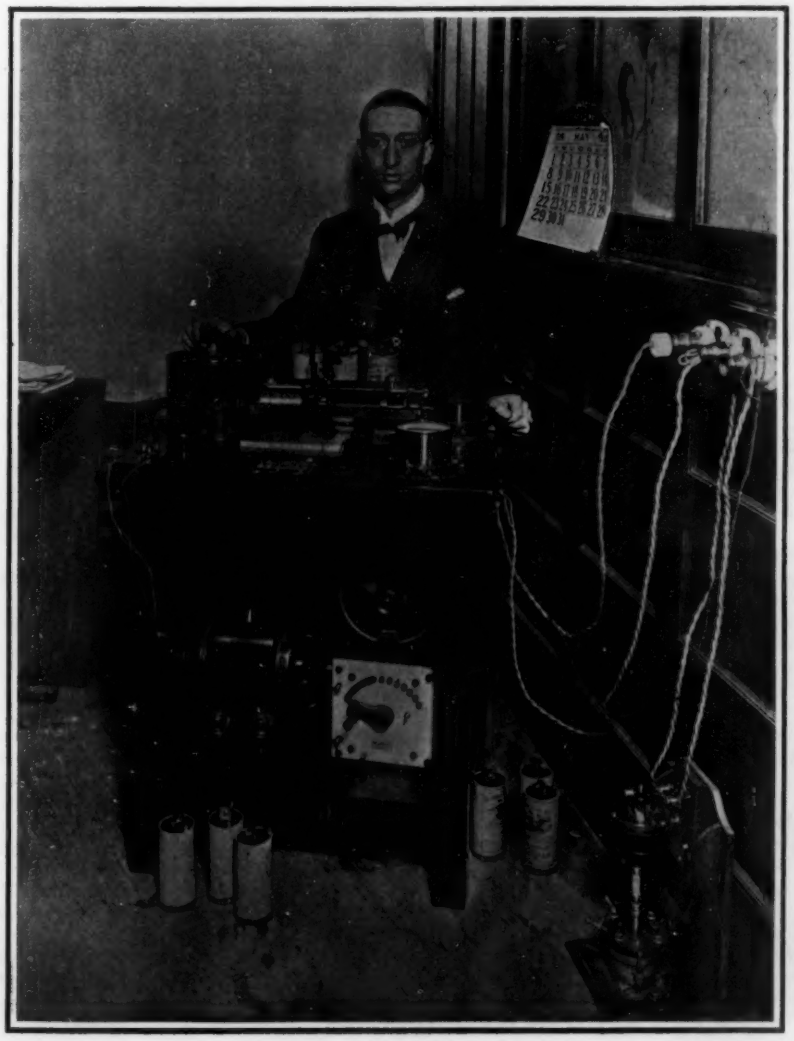
One advantage of Mr. Baker's system is to be found in the fact that the entire operation of transmitting and receiving occurs in full view. It is not necessary to develop a picture before discovering whether anything is wrong with the apparatus. Furthermore, the transmitting cylinder can be used as a receiving cylinder, if necessary.

The ordinary two-station instruments fit into two boxes of moderate size. A portable apparatus, however, has been devised by Mr. Baker, which he claims can be carried from place to place by an operator, so that pictures can be prepared in the field and telegraphed on. Thus plans, positions of troops and of ships, can easily be transmitted.

Perhaps that feature of Mr. Baker's researches which will interest the readers of this journal most is the adaptation of his apparatus to the transmission of pictures by wireless telegraphy. The principles may thus be explained: Conceive a small incandescent lamp, coupled with the local side of a relay and battery, the relay being actuated by means of a coherer. When a Morse key, closing the primary of an induction coil, is depressed, the lamp glows until the coherer is tapped. The taps can be controlled by the lines in a photograph or sketch and the light of the lamp can be concentrated on a revolving photographic film. Mr. Baker applies the principle in the manner shown in Fig. 2. A line picture is attached to the drum of the transmitter, and the intermittent current ordinarily passed into the telephone line flows into the electro-magnet end. The magnet M attracts the diaphragm Q, and brings the platinum contacts P-Q together. When they are in contact the primary of the transformer is closed, and the spark gap of the secondary, inductively coupled with the aerial and the earth, sends out oscillations. Hence the length of the signals and their distance apart are regulated by the lines of which the photograph or drawing to be transmitted is composed.

When working with currents of 110 volts, arcing must be prevented. This is done with the aid of a mercury interrupter. The receiving apparatus is simple, and for a short distance involves the use of a coherer cymoscope of peculiar character. Whenever the oscillation passes the antenna the coherer becomes conductive and a relay is actuated which starts a vibrating hammer. In order that the hammer may strike only once for each signal, the arrangement shown in Fig. 3 is employed. The relay R actuates the electro-magnet E E, which attracts the armature M N. This motion brings the resilient hammer H, provided with the platinum contact P, against the contact pin fixed to the collar F of the coherer A B. Thus the local circuit is closed, and a black mark appears on the chemical paper. Successive marks can be obtained at intervals of 0.017 second. Up to the present, this device has been successfully used only for line drawings. The apparatus, however, might be used for the transmission of sketches and plans. Mr. Baker suggests that military plans could be done in shellac ink on a slip of metallic foil placed upon a portable machine coupled to a military wireless set, and communications could thus be exchanged. What is more, such a communication cannot be tapped. Even if the enemy were in possession of an exactly similar instrument of the same dimensions and screw thread, the picture received will be quite confused, if the rate of running is altered by five or ten per cent, according to pre-arranged signals.

A special form of Einthoven galvanometer is employed by Mr. Baker for working the relay, which galvanometer has a very intense magnetic field. Instead of the usual silver wire, a silver quartz fiber one twelve-hundredth of an inch in thickness, is employed. This galvanometer is combined with the valve receiver for detecting wireless oscillations recently invented by Prof. Fleming. When the rectified currents, which in ordinary radio-telegraphy cause the telephone to sound, are sent through the silver quartz fiber, the string is shifted. The shadow of the string lies over a fine slit, which is thus opened by the oscillations. In order to be able to use



MR. THORNE-BAKER AND HIS TELEPHOTOGRAPHIC APPARATUS.

a wider slit Mr. Sanger Shepherd has fitted the apparatus with a fine shutter, and in that case the receiver can be modified. The beam of light is then directed through the tunneled poles of the electro-magnet, and a pair of narrow compensated selenium cells is placed behind the slit, a positive lens being interposed. Any dot received shifts the fiber laterally; light falls on the selenium cells, and their reduced resistance allows a battery to actuate a relay which throws the telephotograph receiver into circuit.

HOW THE "FLORIDA" WAS LAUNCHED.

The launching of the "Florida," which took place strictly according to schedule, at the Brooklyn navy yard, on the morning of May 12th, was an unusually brilliant function. In its technical aspects the launch was particularly successful; and we offer our congratulations to the naval constructors who were directly responsible. The ship is now tied up at the navy yard dock; where she will receive her side armor, which is already assembled at the yard, and her turrets, which are also about ready for placing.

A most interesting feature of the day was a dinner in celebration of the event, given by the employees of the yard who built the ship. This event, at which some 1,200 were present, included among the speakers Vice-President Sherman, Governor Gilchrist of Florida, Assistant Secretary Winthrop of the navy, Admiral Leutze, the commandant of the navy yard, Naval Constructor Baxter, and others. Capt. Baxter referred to the strong personal interest taken by the whole force of men who worked upon the "Florida" in the success of the ship. To the Editor, who was present as a guest, the genuine enthusiasm raised among the men whenever any reference was made to the ship, the yard, and its officers, seemed to be a strong indorsement of the policy of having at all times a battleship under construction at the New York yard.

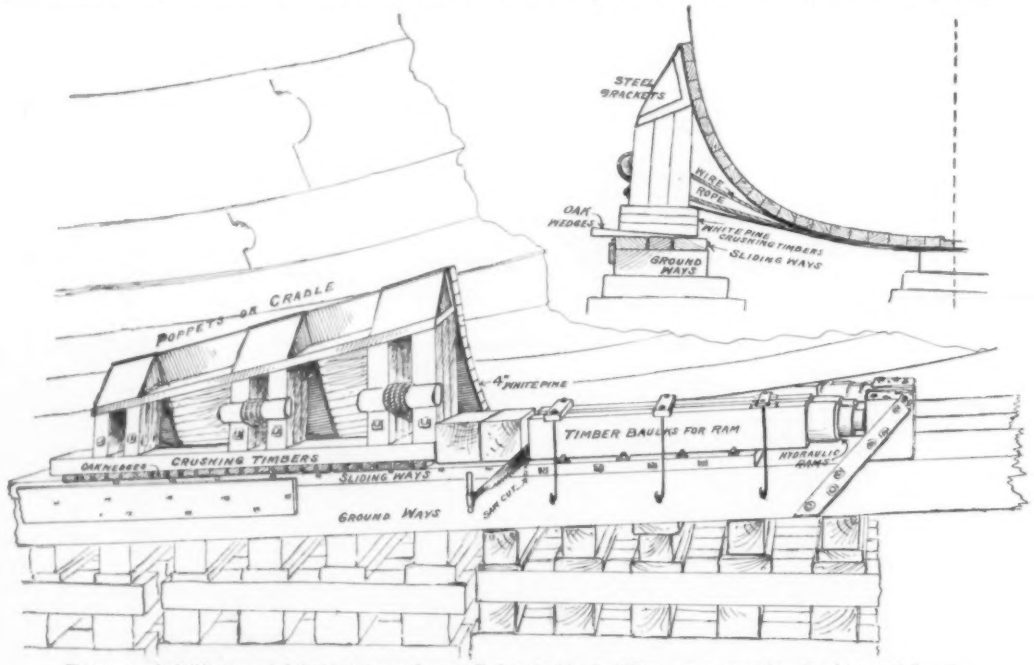
In response to several inquiries as to just how a battleship is launched, we have prepared the accompanying sketches, showing a portion of the launching ways near the bow. The permanent or "ground" ways consist of rows of piling driven to a solid bearing, upon which are spiked heavy, square timbers, or "caps," running transversely. Upon these are laid series of heavy, longitudinal, square timbers in three parallel lines; one immediately beneath the keel, and one on each side of the ship between the keel and the bilges. During construction, the weight is carried upon the keel blocks and upon hundreds of shoring timbers. When the ship is ready for launching, and a few minutes before the actual launch, the weight of the ship is transferred from the central keel blocks and the shoring timbers to the two parallel lines of launching ways. Each permanent way, built up of heavy, square timbers, presents a sliding surface, four feet wide, extending the whole length of the ship and down a considerable distance into the water. The permanent ways are fastened firmly down to the cross caps and piling below. The launching ways, which are also four feet in width, are attached to the hull of the ship, and move with it down into the water. Between the under surface of the launching ways and the upper surface of the permanent ways is a thick coating of grease, oil, and other lubricating substances. The launching ways have to be molded to the form of the ship, for which they form a cradle, and our drawing shows part of the cradle near the bow, which is known as the forward "poppets." The poppets consist of six sets of 14-inch by 14-inch timbers in groups of half a dozen. At their upper ends these timbers bed against heavy angle-iron brackets, and at their lower ends they rest upon what are known as the "crushing timbers," long lines of parallel timbers four feet wide, the bottom one of which forms the sliding surface of the launching ways. The above-mentioned angle irons are riveted to steel straps from a half inch to three-quarters of an inch thick and 42 inches wide, which extend down below the keel and up to similar brackets on the other side of the ship. The space between the straps and the hull is filled in with four-inch white pine timbers, which form the bed in which the bow of the vessel rests. To assist in tying the whole cradle together, heavy wire ropes pass beneath the bow and are carried around heavy oak thimbles, placed on the outside of the poppets. Further support is given by 1¾-inch tie rods, which are drawn up snugly by nuts on the outside of the poppets.

The crushing timbers are provided throughout their entire length with a series of oak wedges interposed between them and the launching ways below. About half an hour before the launch, hundreds of workmen range themselves up and down the ways, and by means of heavy sledges drive these wedges home, forcing the launching cradle into closer contact with the ship, and eventually lifting it sufficiently to clear it from the keel blocks, thus transferring the load entirely to the launching ways.

This brings us to the consideration of the interesting method by which the ship is held in place, and prevented from starting off down its well-greased "toboggan," until the exact moment when the christening is performed and the order is given to let go. The locking and starting gear are as follows:

The hardwood launching ways are extended forward, and strongly bolted down to the ground or permanent ways. After the wedges have been driven home, and the ship is resting on the inclined and well-greased surfaces, it is prevented from moving solely by these bolted connections. At the critical moment, at the word of command, carpenters armed with cross-cut saws commence to saw through these timbers, and, as the cut is made, a point is soon reached where the tensional strength of the remaining timber fails to hold the vessel. It parts with a loud report, and almost invariably the ship starts, slowly at first, and then more rapidly, for the water.

Occasionally a vessel will stick and must be given a start. For this purpose, four heavy ramming timbers are laid in position abutting against the end of the launching ways, with hydraulic jacks interposed between them, and heavy timber abutments. Should the ship "hang," a brief operation of the jacks is generally sufficient to start her.



The upper end of sliding ways is bolted to the ground ways. To free the ship, the sliding ways are sawn through, when a push from the hydraulic rams (if necessary) sets her in motion.

LAUNCHING WAYS AND CRADLE OF "FLORIDA" NEAR THE BOW.

Reducing the Number of Appeals in the Patent Office.

Mr. Frank D. Currier of New Hampshire introduced on January 21st, 1910, a bill the principal purpose of which is to expedite the granting of patents in the Patent Office, and to eliminate one appeal in the office. In his last annual report the Commissioner of Patents recommended such legislation and advocated a measure which would combine the Commissioner, the First Assistant Commissioner, the Assistant Commissioner, and the Examiners-in-Chief into a single appellate tribunal, any three of whom shall constitute a quorum, to which all appeals shall lie, whether from the Primary Examiner or from the Examiner in Interferences, and from which appeals would lie to the Court of Appeals of the District of Columbia.

Under the present patent law in *ex parte* cases an appeal lies from the Primary Examiner to the Board of Examiners-in-Chief, then to the Commissioner (the First Assistant Commissioner or the Assistant Commissioner), and from his decision to the Court of Appeals of the District of Columbia. In interference cases, the course of appeal from the decision of the Examiner of Interferences is the same. This course of appeals undoubtedly imposes an unnecessary amount of delay and expense, throws upon an over-burdened Commissioner the impossible task of giving to each case the amount of personal attention proper to its disposal, as demanded by law. Lastly, the Board of Examiners-in-Chief, as at present constituted, consists of three members, and no provision is made under the present law to supply a temporary vacancy caused by sickness, or other cause, with the result that the absence of one member sometimes results in an unevenly divided Board, and in the consequent necessity for a rehearing. The absence of two members causes an entire suspension of business.

The enactment of Mr. Currier's bill into a law would provide an appellate Board, any three members of which would constitute a quorum, the prosecution of all applications on appeal would be expedited, and the elimination of one appeal would mean the saving to the inventors of one appeal fee, attorneys' fees and incidental expenses. Lastly, one appeal in the Patent Office instead of two would give greater stability to the decisions of the office tribunals, and would also obviate any want of agreement that has at times existed in the past between the decisions of the Commissioner of Patents and the Assistant Commissioners.

The bill is in reality Commissioner Moore's bill, for it was submitted by him to the Secretary of the Interior, who made a careful study of it and transmitted it for the consideration of Congress. The patent profession, as a whole, is in favor of the measure.

The value of the measure will be appreciated when we consider the manner in which the Patent Office does its work. Each of the forty-two examining divisions deals with a special class of inventions. The Board of Examiners-in-Chief, consisting of three men at present, must deal with inventions from all of these forty-two divisions, covering the entire range of mechanical arts, chemistry, electricity, and the like. The members of the Board cannot be experts in all of these widely diverging fields of activity. They must inform themselves upon all these classes of inventions as they come before them. They are supposed to have a special knowledge of all the legal points which are likely to be involved in the appeals on mechanical questions. They must study up and inform themselves so as to be able to explain the technical point at issue. Obviously, in order that these men may keep up with the times, it is necessary for them to study and read much. At present there are hearings every afternoon beginning at one o'clock. There are on the docket seven or eight *ex parte* cases involving the patentability of an invention, or one to two interference cases involving the consideration of testimony taken on both sides, the application of the law, and frequently, the right of the applicant to make the claims. Hence, only the forenoon is left for study and what reading is necessary and the preparation of decisions. It is small wonder that the Examiners-in-Chief find it almost impossible to keep up with their work. Driven to it, they can make some sort of a decision, but to do so properly the invention must be studied thoroughly, and in interference cases the testimony must all be read, even though it may involve thousands of pages. With only three men on the Board, the time has come when it is necessary to do something in the way of relief, so that prompt and correct decisions may be handed down. Just now the Board is several months behind its work. The result is that to get an appeal through the Board of Examiners probably requires three to four months' time. The bill in question saves so much time in getting a case through the Patent Office. It practically provides six men to do the work that three are now trying to do, without any additional cost.

At the present time, the same work is done over twice in the Patent Office for no very good reason. The theory of the present course of appeals is that under the decision of the present Board of Examiners-in-Chief, there will be an appeal to the Commissioner in person. It is impossible for the Commissioner of Patents in person to give due consideration to all

these things which are appealed to him. He has to have the help of his Assistant Commissioner, and he also has to have the help of law clerks. The situation is, therefore, this: Instead of getting the decision of the Board of Examiners-in-Chief, the only chance the Board has of getting together and forming an opinion on a case is after hearing the arguments which are made by the attorneys. The Board then tries to come to some conclusion at that time. If it does not, then the work is to be divided among the members of the Board, and each one has to prepare his share of the cases, and then explain his decision after it is rendered to the other members of the Board, whereupon they decide whether they will concur or dissent. Obviously, the decision does not exactly represent the views of all the members of the Board. Sometimes they have so much work to do that they have to pass it over and sign it any way.

For these reasons, it would seem that the Currier bill is worth enacting into a law.

A PHENOMENAL OIL GUSHER.

BY CHARLES CARROL WRIGHT.

The largest oil gusher in the history of California, and perhaps the most profitable in the world's history, is the Lakeview in the Maricopa oil field, forty miles southeast of Bakersfield, Cal. The gusher started to spout on Tuesday morning, March 15th, and, save for a period of eight hours in which it "sanded up" on March 21st, when it burst forth of its own accord like a volcano of oil, the well flowed continuously up to March 31st, averaging a flow of 42,000 barrels of oil of 18 gravity Beaumé each 24 hours, as measured in the run-off from the sump hole through a ditch in which the oil runs to a rapidly built pipe-line. Since that date the flow has continued at the rate of from 42,000 to 45,000 gallons, and up to May 3rd it had delivered about 2,000,000 barrels of oil.

The marvel of the gusher has been its sustained productivity. During the two weeks following March 31st, 1910, more than one-half million barrels of high-grade crude petroleum had been collected from the well. The stream rises intermittently from 170 to 240 feet above the top of the derrick, which, before the crown or top was carried away by the stream of oil, was 84 feet in height. The oil sands were struck at 2,300 feet, at which point a tremendous gas pressure was encountered, and the drillers were suddenly amazed at seeing small rocks hurled hundreds of feet in the air through the eight-inch casing. After the oil sands were struck, the well rapidly "drilled itself" to a greater depth. The well promises to keep spouting for many months to come.

The well can be heard roaring for more than a mile. Spray from the gusher has been carried a distance of two and a half miles, and hundreds of automobiles have carried sightseers from Bakersfield to witness the unique sight. The sage brush for a distance of half a mile around the well is coated with oil, and several jack rabbits killed by the flow were brought by small boys into Maricopa. All efforts to "cap" the gusher have proved unavailing; the force of the oil flow carried away the crown or top of the derrick and fifteen feet of its uppermost structure; and the tremendous flow created a huge lake of oil extending for hundreds of feet on every side of the derrick.

From a money viewpoint the gusher is said to be the most valuable in the world's history, far exceeding the famous Texas gusher in the Beaumont field, which caught fire and subsequently ran into salt water; for the owners of the Lakeview had netted by March 31st over $300,000 from the oil, which is now being piped to tidewater from Maricopa in the San Joaquin valley to Port Harford on the Pacific coast, a distance of 150 miles.

To control the oil from the gusher was in itself no slight achievement. Shortly after the great stream amazed the drillers, three pumps, with a combined capacity of 25,000 barrels daily, were started working at top speed, pumping oil out of the sump-hole; and the oil so recovered was the first oil to enter the huge tanks built by the independent producers of California.

The big well, which is one of the seven gushers "brought in" in the Coalinga and Midway-Maricopa oil fields of California within the past month, is due to the persistency of a sing'e man. A discouraged board of directors, three days before the gusher was struck, decided to quit drilling. The order was given; but the superintendent conveniently forgot it. He drilled 47 feet more against penalty of dismissal, and the bit entered the oil sands.

To date all efforts to cap the well have proved unavailing, and the oil is now rushing heavenward both on the inside and the outside of the steel casing.

It is an interesting fact that lately the gravity of the oil has risen from 18° Beaumé to 20°. This has been taken to indicate that the oil is now being drawn from a lower strata or "pool."

Correspondence.

WEIGHT DISPOSITION IN AEROPLANES.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of April 30th Mr. Godfrey assumes that the center of suspension and center of thrust are coincident, center of gravity low, and center of resistance to the lateral motion in vertical rudder high.

In an aeroplane with perfect stability the center of gravity should be low; the center of thrust below the supporting plane yet in the center of resistance to forward motion, and the vertical rudder below the center of suspension yet at the center of resistance to lateral motion. In my monoplane the operator by shifting his weight slightly can raise the inner wing in making the turn. MOSES FRANKLIN.

Grand Junction, Colo.

WEED-CUTTING BOATS.

To the Editor of the SCIENTIFIC AMERICAN:

I have been a constant reader of the SCIENTIFIC AMERICAN for, I think, more than thirty years—back as far I can remember, anyway. In the issue which I received Saturday, I noticed an illustration of a weed-cutting boat and a description sent by your Paris correspondent. While I do not know that there is a specific statement in the article that it is a new scheme, certainly one can only gain that inference from the reading.

While I do not remember to have seen a weed-cutting boat exactly similar to that one, they have been in use in this country by many of the ice companies for many years. The Consumers' Company of this city, of which I was vice-president and general manager for a good many years, something like ten years ago built a boat at their own works for this purpose, and while, owing to the fact that gasoline engines were not then so universally used as at present, steam power was used for its propulsion and for the operation of the cutting knives, yet its purpose was the same, and it accomplished the same end, and in my judgment was in some respects better than this French device. As I remember it, we merely built a flatboat about ten feet wide and forty feet long. We mounted the wheel at the stern, after the manner of Mississippi River steamboats, instead of at the bow as in the French boat, and we placed the cutting knives at the bow. They were about the same type as those used on mowing machines, and were operated by the same engine that propelled the boat. We merely used a small upright boiler and a single-cylinder vertical engine for power, transmitting the power to the stern wheel by chains and to the cutting knives by bevel gears and shafting. Right at the front end of the boat, convenient to the pilot, was a clutch for throwing the cutting knives in and out of gear. The knives were raised and lowered by a gear controlled by the same person. This boat at times was run by one individual. Of course, it was better to have two—one as engineer and the other as pilot. It was arranged to cut to a depth, I think, of four feet.

I know of several boats of this same character used by various ice companies, and I think in one respect they are very much better than the French boat, as the cutting knives are in front, and the pilot knows just what he is doing all the time, and of course, he can run the boat very much nearer the shore and cut the weeds out in very much shallower water. Then again, the French boat runs over the tops of the rushes, pushing them down possibly, so that the weed-cutting knives would not cut them at all.

Chicago, Ill. JOHN BENHAM.

Death of Prof. Angstrom.

The well-known Swedish physicist, Dr. Knut Angstrom, is dead. To the general public his passing will mean little, because his investigations were not of the character that attracted public attention. To the scientist his death means a sad loss, for in him physics has been deprived of one of its ablest investigators.

Prof. Angstrom was the second generation of a family distinguished for its scientific researches. His father, Johan, achieved fame by reason of his splendid study of the solar spectrum. His son, Knut, was born in 1857. He studied at the University of Upsala, where he afterward taught. He occupied a professorial chair at the time of his death.

Angstrom's first researches were made in the field of spectroscopy. By means of the spectrobolometer, he studied the phenomena of absorption in the infrared spectrum, notably for carbon monoxide, carbon dioxide, water vapor and ozone. These investigations gave rise to an interesting controversy with Arrhenius. Water vapor, carbon dioxide and ozone have a marked influence on the temperature of our globe. In effect, they partially hamper the radiation of the earth into inter-stellar space, and thus aid in maintaining the surface of our planet at a temperature compatible with the conditions of life. With these facts as a basis, Arrhenius built up an ingenious theory to account for the glacial period. He supposed that the quantity of carbon dioxide contained in our atmosphere has increased since that period. Angstrom proved that Arrhenius' reasoning was valid only for carbon dioxide of almost infinite tenuity, and that the possible variations of the tenuity of carbon dioxide in the air could not possibly have had any influence on the temperature of the earth.

Angstrom's name will be forever linked with the study of solar radiation. An instrument which he invented for the purpose of measuring this radiation, and known as the Angstrom pyrheliometer, is now widely used in observatories.

The Current Supplement.

The government dam across the Salt River at Roosevelt, Arizona, is nearing completion after about six years of active work. The dam is excellently described and illustrated in the opening article of the current SUPPLEMENT, No. 1794, by Edmund G. Kinyon. In an article entitled "New Methods of Polar Explorations," the forthcoming expeditions of Lieut. Wilhelm Filchner and Capt. Scott are described in detail, as well as other expeditions. The current problems of most interest to those engaged in the branches of science associated with marine construction are usually brought into high relief at the annual meeting of the Institution of Naval Architects. In the present year this has been particularly the case. A summary of the Institution's proceedings is presented. The inauguration of the Oceanographic Museum at Monaco took place on March 28th in the presence of representatives of the governments of France, Germany, Italy, Spain, and Portugal, and a great gathering of men of science of all nations, who were invited by the Prince of Monaco. The museum is made the subject of an interesting illustrated article. Dr. E. E. Barnard, of Yerkes Observatory, has made a special study of the aurora. In the current SUPPLEMENT the results of his observations between 1902 and 1909 are presented. On May 18th, at 9 P. M. eastern standard time, Halley's comet will pass directly between the sun and the earth, and its tail will sweep over and envelop the earth. In this connection it is interesting to note that a miracle book of the sixteenth century mentions the passage of a very large comet between the earth and the sun and a phenomenon apparently connected therewith. The circumstances of the passage, as given in the work, are published. Perhaps the biggest comet of the nineteenth century was that of Donati, which appeared in 1858. At the time, Charles Dickens was Editor of Household Words, in the pages of which magazine there appeared an interesting article on the appearance of the comet—interesting because of its attempt to present the phenomenon in a popular way, and also curious in the light of our more advanced cometary knowledge. "Visible Molecules, Corpuscles, and Ions" is the title of an article in which the modern theory of matter is discussed.

A Stabilizer for Aeroplanes.

Regnard has designed an automatic device for steadying the flight of an aeroplane, in which use is made of the invariability of the axis of rotation of a gyroscope. For stabilizing an aeroplane, however, it is not necessary to have a gyrostat of great mass, acting directly upon the axis of the aeroplane. A small gyroscope, weighing only a few pounds, suffices to establish electric contacts in the frame which contains it. By means of these contacts, currents are sent through motors which operate the steering organs of the aeroplane. Two motors are required for this purpose, but they may be very small and light, because they act upon the rudders by means of levers. Regnard has not yet had an opportunity to apply his invention to a real aeroplane, but he has submitted to the French Academy of Sciences a model of an aeroplane about three feet long, resting on a box which contains a gyrostatic stabilizer. When the system is inclined in any way the steering organ, whose function it is to restore the axis to its original position, is at once automatically set into motion.

What One Firm Pays for Patents.

A recent report of the General Electric Company, covering the period of the eleven months ending December 31st, 1909, contains some remarkable figures. During the fiscal year, the company paid for patents and patent litigation the sum of $904,207, which sum is not counted as an asset, but is charged over to profit and loss. All the company's valuable patents, franchises, and good wills stand in the balance sheet at a nominal valuation of one dollar.

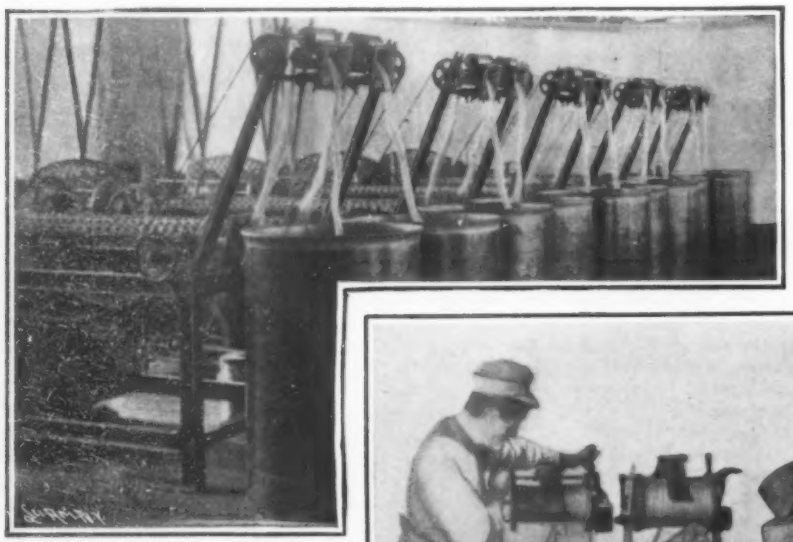
Mr. Richard Blees, an inventor who did much to improve machinery of various kinds, died recently at Richmond Hill, Long Island, at the ripe age of 95 years. He patented the Culver switch and the first scaling ladder used by the New York Fire Department. Hydraulic water-pressure systems for skyscrapers and improvements in sewing machines are also to be credited to him.

THE MANUFACTURE OF TWINE

BY DAY ALLEN WILLEY

What is generally known as hemp twine, used in such enormous quantities for various purposes, is manufactured from two varieties of fiber known as Manila and Sisal. Needless to say, the first named comes from the Philippine Islands, forming one of the principal products of this possession of the United States, while the Sisal is secured principally from Mexico, the State of Yucatan contributing the largest supply. An idea of the extent of Manila hemp manufactured can be gained when it is stated that each year no less than 125,000 tons are shipped from the city of Manila, most of it coming to the United States.

The fiber from the Philippines is obtained from a species of the banana family, which attains a height of fifteen or twenty feet. The stems of the separate leaves grow in a close cluster, forming what appears to be a solid tree trunk, to the height of ten or twelve feet, where they separate and branch out like the limbs of an ordinary tree.



Type of spindles used for converting hemp into twine.

The natives cut these stalks off near the ground, removing the leaves from the top of the stalk, then separating the stems and removing the pulp from the fiber by repeatedly drawing it across the edge of a dull blade pressed on a block of wood. This primitive method of cleaning the Manila fiber has not as yet given place to modern machinery. The average day's work of a native is eighteen pounds of cleaned fiber.

This work of growing and cleaning the fiber is confined to the mountainous districts. After the fiber has been dried it is packed in convenient sized bundles and brought down to the coast villages, where it is purchased by exporters, who sort the fiber and press it by machinery into bales convenient for shipping. These bales are protected by mattings woven or plaited from rushes by the natives, and are secured by rattan bands.

The Henequen plant furnishes the Sisal fiber which is brought to this country. The plant bears a remarkable resemblance to the well-known century plant, and is frequently mistaken for the latter on account of its appearance. As it forms one of the principal products of Yucatan, the Sisal plant is cultivated on large plantations, principally by Indian labor. The young plants on these plantations are set out in rows about ten feet apart. About the fifth or sixth year the plant is sufficiently matured, so that the under and larger leaves are cut, and the pulp removed by decortication, leaving the fibers to dry in the sun; they are then baled ready for market. The plant continues to grow, and produces about a dozen mature leaves each year. At the end of a period ranging from fifteen to twenty years the plant dies, and is replaced by a young one.

The method of gathering the Sisal and shipping it to market is much more systematic than the process employed in the Philippines, for nearly all of the Sisal plantations have tramways extending through the Henequen fields, so that as fast as this curious harvest is gathered it can be loaded directly on cars and drawn by mules to the factory, where it is converted into fiber. This is done by the usual method of decortication. The material is fed into the receiving hoppers of the mill by means of an endless conveyer, the leaves being laid upon the surface of the conveyer side by side. By means of toothed wheels they are cut lengthwise into shreds. In this state the material is passed through mechanical cleaners which remove all of the pulp. Next the fiber passes out of the decorticator and is carried to yards adjacent to the mill, where it is hung upon lines and dried by exposure to the heat of the sun. This process concluded, it is pressed into bales of convenient size, and is then ready for shipment to the United States. As already stated, the preparation of Manila fiber is done almost entirely by hand, and before being exported it is also dried in the sun, the natives using long poles, however, instead of rope or wire as at the Mexican plants.

Machines for balling the twine.

The manufacture of both the Manila and Sisal fiber into the twine of commerce is performed by practically the same process. The interior of the modern twine factory is somewhat similar in appearance to that of a modern cotton mill, with the exception that some of the machinery utilized in the latter is missing. This is due to the fact that less care is required in the preparation of the fiber for spinning, since its appearance usually does not increase the value of the finished product. As is well known, the preparatory machinery in a cotton mill is by far the most elaborate apparatus installed. It includes the opening and scutching machine, by which the material is cleaned from dirt and other foreign particles. As the fiber is not a mass of lint like raw cotton, this mechanism is not required, nor is it necessary to form it into bats preparatory to carding. In the modern twine mill, however, the fiber is passed through mechanism which is somewhat similar to the carding engine and performs the same duties, disentangling the fiber by means of revolving cylinders provided with cards which are suitable for treating such coarse material. When carded the fiber is drawn into a conduit, through which it passes between calender rollers and emerges from the machine in a coarse strand. It is then coiled in large heaps either upon movable racks or the floor. This is the first process in preparing the hemp—for such it has now become—for spinning, but before being conveyed to this apparatus, it goes through what is called the finishing machine. This combines in part the drawing and slubbing frames of the cotton mill, so that when the material emerges from it, the strand has been considerably reduced in size and is slightly twisted, enabling it to be coiled in cans, from which it is fed to the spinning jennies. While the spinning machine is of course designed for treating this fiber especially, it is as automatic in its operation as the modern self-acting mechanism, and no more human labor is required to convert the slivers into finished product than is required in the manufacture of yarn and thread from the ordinary cotton. The twine spinning machine includes drawing rolls for lengthening the sliver, the material as it issues from them being twisted by the action of the spindles mounted upon carriages which adjust themselves to the movement of the drawing rolls.

As fast as the twine is spun it is also wound on a large spool or bobbin, the latter being taken to the balling machine as soon as it is filled with the twine. The balling machines are also automatic in their operation, not only winding the ball from the bobbin, but discharging the finished ball automatically when it has reached the proper dimensions. These machines are calculated to wind balls weighing five pounds each, where the twine is used in connection with binders and other agricultural machinery, the balls being packed into cases holding ten each.

At the McCormick plant, which is illustrated in the accompanying engravings, several grades of hemp twine are produced, one of which includes the mixture of Mexican and Manila fiber, as this is found to be very durable. To show the difference in the weight of the material it may be said that a pound of such twine contains 600 feet. The twine made entirely from Manila is slightly finer and averages 650 feet to the pound, while the Sisal is the coarsest, averaging 500 feet to the pound.

Bales of twine ready for shipment

THE MANUFACTURE OF TWINE.

Educating the Farmers by Rail.

BY H. A. CRAFTS.

California sees a way to solve the food problem by educating the farmers.

She believes that the farmer is never too old to learn.

She also believes in teaching the young to be farmers.

Accordingly, the State maintains a college of agriculture, a university farm, polytechnic school, United States experiment stations, etc.

Now she proposes to introduce the study of agriculture into the public schools of the State.

A substantial beginning in this line has already been made in the establishment of the study in the high schools; later on it will find a place in the primary and grammar schools.

Then California has its farmers' club, granges, and farmers' unions scattered all over the State, and these organizations exercise a large influence upon the educational thought of the day.

Every year some hundred or so farm institutes are held in various parts of the State and reach annually between 20,000 and 25,000 farmers.

California has the best organized horticultural com-

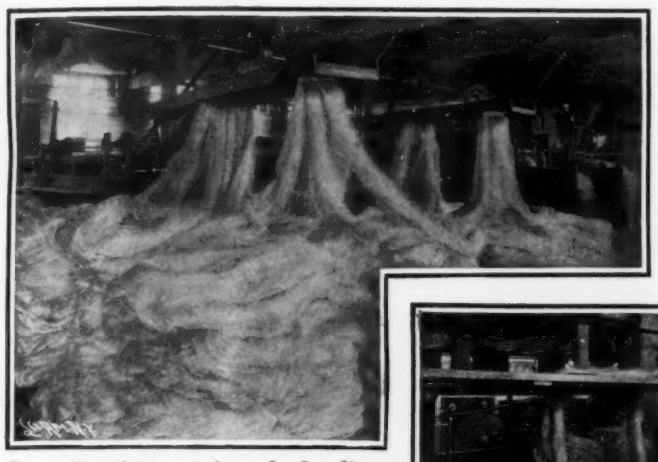
mission in the world, comprising a central office and State insectary at Sacramento and a quarantine department in San Francisco.

Each county covering a horticultural section also has its own local commission, inspectors, etc., while the fruit growers hold two State conventions annually.

These all wield a strong educational influence and add largely to the sum of farm knowledge in the State.

But the latest and most striking feature of California's campaign of farm propaganda is the so-called "Agricultural and Horticultural Demonstration Train."

This train is the joint work of the California College of Agriculture and the Southern Pacific Company, the one supplying the exhibits and corps of lecturers and demonstrators, and the other a fully equipped railroad train comprising three exhibit cars, a lecture car, a sleeping car and diner, all absolutely free of cost to the State.



Separating the coarse from the fine fiber.

The work of the train is arranged in a series of annual tours, covering all the leading agricultural and horticultural sections of the State.

Each series consists of five separate tours, each tour covering from 500 to 1,000 miles, and from twenty to twenty-five stopping places. The work of the train begins in the late fall and ends in the late spring. It does not specialize like the demonstration train of the East, but covers all the leading lines of agriculture and horticulture.

Its corps of lecturers contains some of the ablest members of the faculty of the College of Agriculture, and the president of the university, Benjamin Ide Wheeler, frequently joins the train in its course, and lends his aid to the work of general farm enlightenment.

The Southern Pacific Company very candidly admits its own interested motives in the premises, and frankly explains that it discovered a serious falling off in its local tonnage, and when the matter was investigated it was discovered that the shrinkage was found in the item of farm produce.

They consulted their local freight agents as to the underlying causes, and were told that the principal cause was an exhaustion of the soil.

This was hardly believable, and the company consulted the soil experts of the College of Agriculture, who denied the theory of exhaustion, but explained that the soil had been depleted by a practice of poor cultural methods.

This led to the organization of the "Agricultural and Horticultural Demonstration Train."

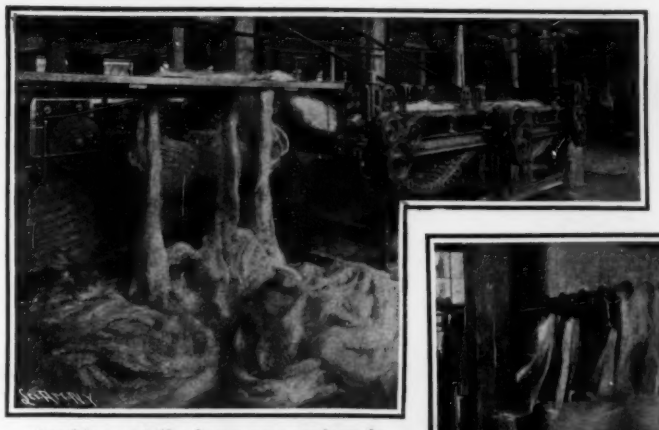
And it only needs a glance at California's industrial statistics to convince one of the truth of this charge of wasteful husbandry.

California thirty years ago was one of the leading wheat-producing States of the Union. In the year 1879 its wheat output amounted to not less than 1,707,500 tons; in 1904 the annual product of wheat had dwindled to 465,028 tons, a shrinkage of more than seventy-five per cent.

California was formerly a great exporter of wheat and flour. In the year 1882 she exported not less than 1,128,031 tons of wheat and 919,898 barrels of flour.

In 1904 her exports of wheat had dwindled to 54,381 tons and flour exports to 882,486 barrels. To-day both the export of wheat and flour are *nil*, and the State is compelled to import a million dollars' worth of wheat annually in order to keep her mills running, and her flour up to standard grade.

And all a result of poor farming, as is evidenced by the fall of the average annual yield per acre of wheat from forty to less than fifteen bushels.



Combing out the hemp preparatory to shipment.

It is this era of wasteful farming that California desires to put a stop to, and hence inaugurates her campaign of agricultural education.

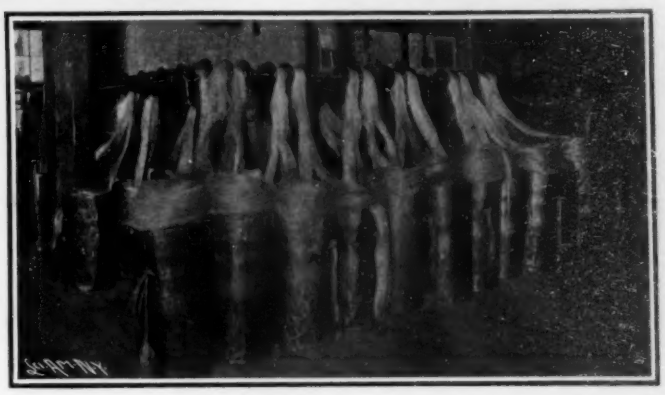
The "Agricultural and Horticultural Demonstration Train" is developing unlooked-for efficacy. It was originally intended for the enlightenment of the present generation of farmers; but its influence is being carried beyond that limit, it is being brought to bear upon the rising generations, and the young folks are fully as much in evidence at the lectures and demonstrations as the older ones.

At each stopping place for lectures the local schools of all grades are dismissed and the pupils allowed to attend; a privilege that is evidently appreciated by all.

They crowd the demonstration cars and lecture car; attend open-air lectures, lectures and discussions in neighboring school rooms, public halls, and opera houses, and are found in attendance whether the gathering be in the daytime or in the evening.

The subjects dealt with by the agricultural and horticultural lecturers cover a wide field, including plant culture, plant diseases, and plant pests, viticulture, animal industry, dairying, seeding and soil treatment, etc.

Special stress, however, is laid upon the vital importance of restoring the lost fertility of depleted soils, and the maintenance in their composition of that vital element known to agricultural sciences as humus, all of which has a direct bearing upon the increase in the production of food-stuffs sufficient to supply the demands of a constantly increasing population.



Winding the material into canisters for spinning.

Fire Control in the National Forests.

Probably one of the best things in the line of an agreement has just been signed by the Secretary of Agriculture and several railroads whose lines run alongside of the national forests. Two of the largest and longest roads in the Northwest (the Great Northern and the Northern Pacific) have right of way through some of the richest timber districts in the West, and this agreement is of great benefit.

They have in view both the reduction to the lowest point of fire risk from the operation of the railroads and joint action by the Forest Service and the railroads to fight all fires which may start along the lines. Both companies have agreed to clear and keep clear of inflammable material a strip of varying width, as conditions demand, up to 200 feet beyond the right of way, and to provide all locomotives which do not burn oil, with suitable spark arresters and other standard equipment to prevent the dropping of fire. An effort will also be made by the companies to so operate their engines as not to cause fires.

In fighting fires the railroads and the Forest Service will co-operate closely. Notification will be made promptly to the Forest officers of all fires discovered by employees of the railroads. Telephone wires to make this possible will be put up by the Forest Service, using the companies' poles where this is possible. Warning whistles will also be sounded by locomotives on occasion.

Forces of fire fighters will be assembled on the outbreak of fires, and will be made up of Forest officers, railroad employees, and such temporary labor as can be gathered by either. The cost of fighting fires which start within 200 feet of the railroads will be borne by the companies, and of all others by the Forest Service, unless it is shown in the first case that the railroads were not responsible or in the second case that they were responsible for the outbreak of the fire. It is the intention of the Forest Service to patrol the rights

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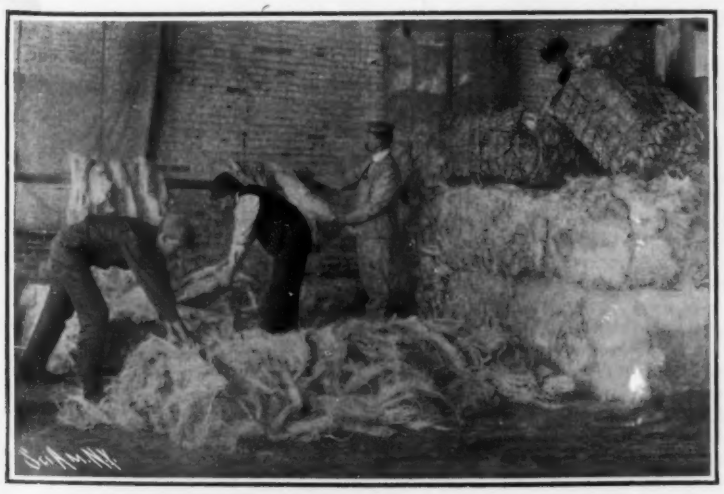
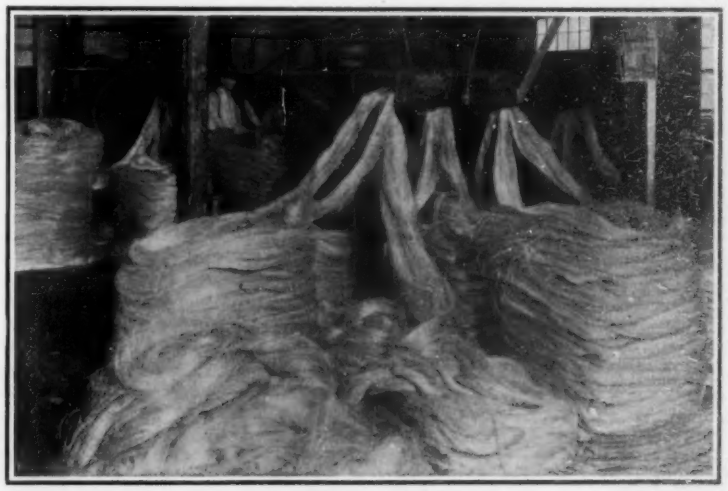


Manila hemp; the raw material as it comes from the ship.



Preparing the hemp for spinning.

THE MANUFACTURE OF TWINE.

DAMMING THE MISSISSIPPI

BY W. P. GREEN

Excelled only by the monster dam across the historic Nile River, the greatest engineering feat in the history of the Middle West is under way on the Mississippi at Keokuk, Iowa, the point from which Col. Roosevelt started his river journey to the far West several years ago. A huge dam is being built across the Mississippi at the foot of the rapids which lie to the north of Keokuk; and the stored energy of the river is to be used in generating over 200,000 electrical horse-power. The power will be distributed throughout the Middle West; the first long-distance transmission line running to St. Louis, 170 miles south of Keokuk, where forty per cent of the power to be developed is now under contract. The bed of the river at this point affords an excellent rock foundation. The dam will be built of reinforced concrete; and over 500,000 barrels of cement, and 7,000 tons of steel will be required in the construction of this gigantic work.

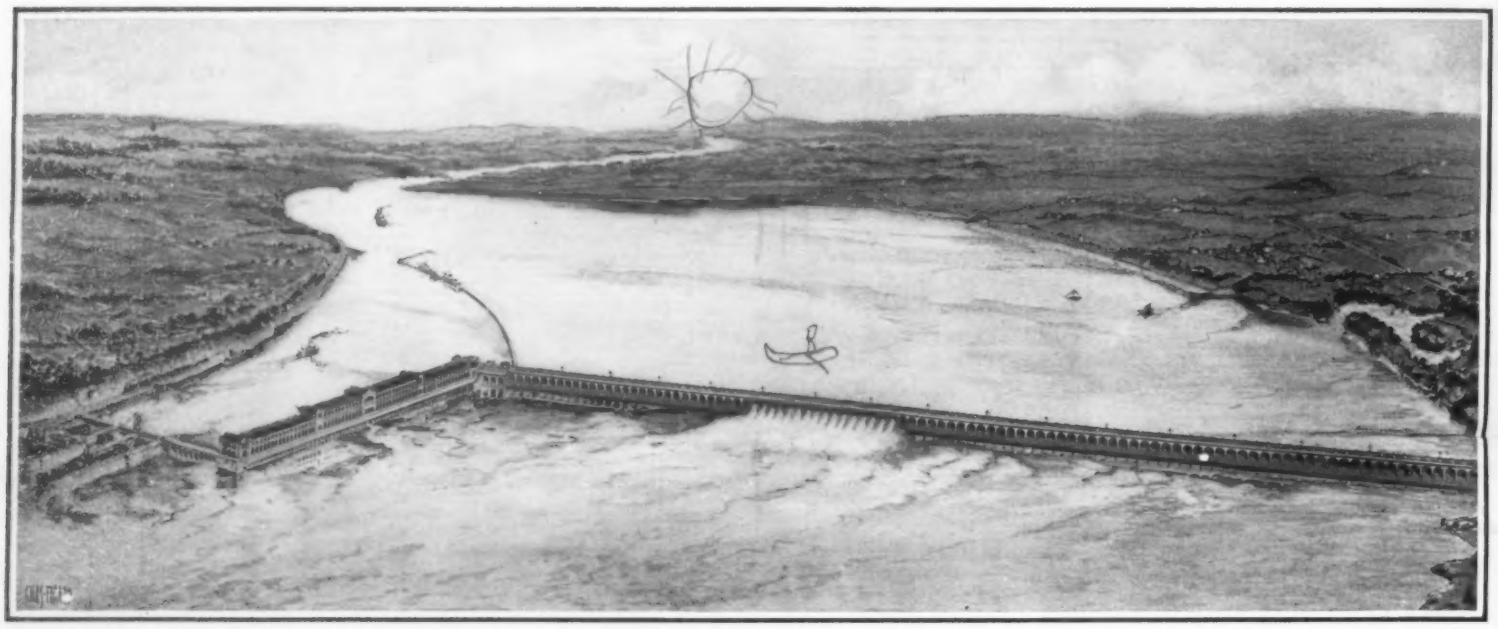
The dam, including abutments, will be 4,700 feet long, or seven-eighths of a mile. The spillway section will be 4,400 feet in length. The dam will rise 37 feet above the river bed, and the base has a width of 43 feet. On top of the spillway will be placed 116 steel flood gates, 30 feet wide and 11 feet high, supported by concrete piers. The piers are to be built integral with the dam, being carried down to bedrock on the upstream side. They will support an arched bridge, from which the gates will be operated by electric hoists. Through the manipulation of these gates the water above the dam will be maintained at a constant level at all seasons.

Four-fifths of the dam, the 4,400-foot section, will extend in a straight line across the river, breasting the current of the broad river. The balance of the dam will be built approximately parallel to the shores and at right angles to the main dam. This portion, 1,400 feet long, 123 feet wide, and 133 feet high, will be occupied by the power house. The substructure, built of massive concrete, will contain the water passages and waterwheel chambers. Upon this will be the superstructure, containing the electric generators, transformers, and switchboards. There will be thirty power-generating units, each consisting of a vertical steel shaft, carrying on the lower part, on the floor of the power house, will be the revolving parts of the generators.

To keep floating ice and logs from entering the power house, an ice fender will be built upstream from the upper end of the power house, curving in toward the shore. This will be 2,800 feet long and built of concrete masonry.

The construction of the dam will entirely destroy the government canal, built to carry shipping around the rapids. This canal now consists of three locks. In its place a single large lock will be built. There will thus be substituted for the canal a lake of deep water over a mile wide at the dam, and 40 miles long. The government has given permission to build the dam. Landowners on both sides of the river will be given a fair price for all land overflowed as the result of the creation of the reservoir.

The construction of this gigantic river project is under the direction of Hugh L. Cooper of New York city. The work of excavation is well under way on the Illinois side of the river, the project will be pushed as fast as the material is delivered at the site.



This huge structure, over a mile in length, is being built across the Mississippi at Keokuk, Iowa. The dam, which is broadly similar to the Assouan dam across the River Nile, is provided with 110 flood gates to control the height of the floods. A lake 40 miles long will be formed and ultimately 200,000 electric horse-power will be generated in the power house shown at the left of the dam.

THE HUGE DAM WHICH IS BEING BUILT ACROSS THE MISSISSIPPI.

The Oceanographic Museum of Monaco.

The Oceanographic Museum of Monaco was formally opened on March 29th, 1910, by its founder, Prince Albert I. of Monaco, in the presence of representatives of various foreign governments. The celebration included a pyrotechnic exhibition and an allegorical pageant in the beautiful bay of Monaco, a gala performance at the opera and other festivities. The new museum, which is also a laboratory, is connected with the Oceanographic Institute of Paris, and both institutions, with an endowment of four million francs ($800,000) have been presented by Prince Albert to the French government in recognition of the hospitality which Paris and France accord to all workers in the field of thought. Prince Albert is president of the administrative council of the Institute, which includes among its members ex-President Loubet and the physicists Cailletet and Becquerel. The direction of the scientific work is confided to an international committee, for it was Prince Albert's design to found an institute and a laboratory in which investigators of all nationalities could work together for the advancement of the new science of oceanography. The lecture courses of the Institute were inaugurated in 1903, at the Conservatoire des Arts et Métiers. The lectures have since been given in the old building of the Academy of Medicine, and at the Sorbonne. The new building of the Oceanographic Institute will soon be completed, and the lectures will be given there after October next.

The Oceanographic Museum of Monaco, which has already received the popular name of the Palace of the Sea, is built on the flank of a steep cliff at the edge of the sea. On the water side the building is 256 feet high, while the height of the main façade, on the land side, is 148 feet, the difference being due to the slope of the cliff. The length of the building, parallel to the water front, is 330 feet. The cost of construction exceeded $1,500,000. There are only four stories, and the rooms are very high, large, and well-lighted. The two lower stories, which are partly underground, contain the aquariums and laboratories, while the upper stories are devoted to the exhibition of sounding and other apparatus, and of the rich and varied collections of deep-sea fauna and flora which represent the result of a quarter century of exploration. Prince Albert has also placed a small steamer, the "Eider," at the disposal of the Museum.

Almost every year since 1885, the Prince of Monaco has made a scientific cruise in the Mediterranean, Atlantic or Arctic Ocean. The experience acquired with the "Hirondelle," a sailing yacht of 200 tons, and afterward with the "Princesse Alice I.," an auxiliary three-masted schooner, 170 feet in length, was put to good use in the construction and equipment of the "Princesse Alice II.," with which the later cruises have been conducted. This vessel has a steel hull, a length of 240 feet, a breadth of 34 feet, a displacement of 1,400 tons, and a maximum speed of 13 knots. It contains the most improved apparatus for taking soundings and temperatures and collecting specimens of fauna, flora, sand, mud, etc., at very great depths. A great part of this apparatus was invented and constructed by the Prince and his assistants.

The cases of the Museum contain representatives of all known deep-sea fauna. Many of these specimens are interesting even to the non-scientific observer because of their strange forms, beautiful colors, and peculiar organs of sight and touch.

These oceanographic explorations and collections also possess great practical value, in addition to their scientific interest. Most edible fishes feed upon the plankton or mass of small animal organisms which are wafted hither and thither by even feeble ocean currents.

The explorations have proved that the plankton moves in a manner dependent on the season and the locality. These migrations appear to be governed by complex laws, the knowledge of which, as it is gradually developed, will be of great value to the fisheries, especially to the steam fisheries, as the fish follow the plankton.

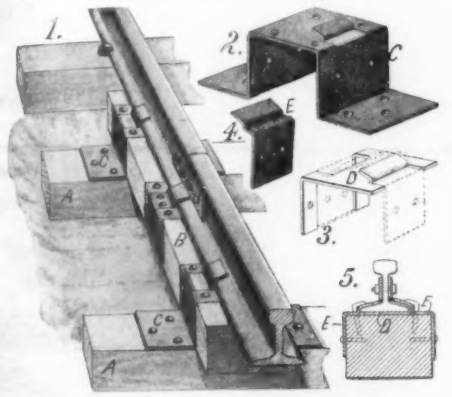
In commemoration of the inauguration of the Oceanographic Museum, the Prince of Monaco has caused a plaque to be struck in gold, silver and bronze. The six gold plaques were presented to the president of the French Republic, and the sovereigns of Germany, Italy, Spain, Portugal and Monaco. One hundred plaques in silver and twenty in bronze were distributed among the other invited guests.—L'Illustration.

The Electrical World remarks that in a report submitted by the chief signal officer of the United States army to the Secretary of War, it is stated that there are now in the army service a total of 39 wireless telegraph stations, of which 13 are in the United States, 9 in Alaska, 5 in the Philippine Islands, 5 on artillery harbor tugs, and 7 in the army transport service. The signal corps has purchased a 2-kilowatt 100,000-cycle alternator for wireless telephone service. The advisability of the United States adhering to the International Radiotelegraphic Convention, 1906, is recommended for the consideration of the United States Senate. Wireless telephone equipments are now being erected at the Bureau of Standards and at the quarters of the signal corps of the army, in Pennsylvania Ave., Washington, to make experiments with the object of selecting the best devices for army service.

Patent Department

IMPROVED RAIL CONNECTION.

To prevent the destructive hammering of the rails when depressed by the passage of a train, a new construction has recently been designed to furnish a more substantial support at the rail joints for them. It

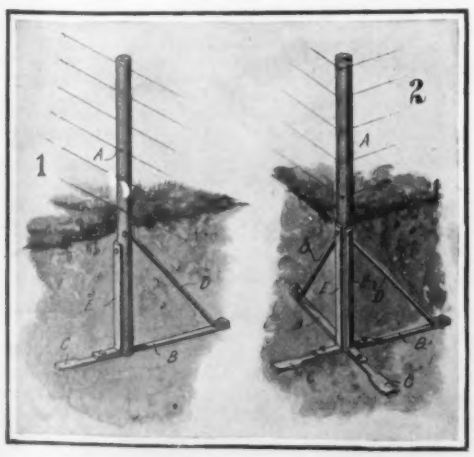


IMPROVED RAIL CONNECTION.

consists in providing timbers or ties running longitudinally under the rails at the joints. In addition to this, a number of very substantial metallic fastenings serve to clamp the rails tightly in position. It is usually the case that the joints of a railroad are arranged to come between and not on the ties and heavy fishplates are depended upon to support them. The construction here illustrated is intended to offer an improvement on such an arrangement of the joints. As shown in the accompanying engraving, the two ties *A*, between which the joint comes, are depressed, and on them is laid the longitudinal timber *B*. The latter is clamped down to the ties by means of a metal fastening *C*, which is shown in full in Fig. 2. This is substantially of U-form, and may be termed a "saddle piece." It is preferably mortised into the timber to the depth of its thickness. The base flanges are secured to the ties by means of spikes. Each saddle piece is cut out at the top to form a hook or lip that engages the outer side of the rail base, and thus prevents outward movement or spreading of the rails. At the joint the rails are connected by the usual fishplates and bolts and are secured firmly to the timber *B* by means of a metallic fastening *D*, such as shown in Fig. 3, and a pair of fastenings *E*, such as shown in Fig. 4. Fig. 5 is a cross-sectional view of the rail joint, and shows how these fastenings are applied. The fastening *D* is approximately L-shaped, and passes under the base of the rails, being formed with a hooked portion, which engages the inner side of the rail base. Over this hook, one of the fastenings *E* is applied, while at the opposite side is another fastening *E*, the fastening *D* being cut away to receive it. Thus a very strong joint is provided, which should reduce the unpleasant hammering noise at the joints and also increase the safety of the railroad. The inventor is Mr. Henry Grass, of Alvin, Texas.

FENCE POST ANCHOR.

A patent has recently been granted on a novel method of supporting a fence post, so that it will withstand excessive strain. The construction will be especially useful for anchoring corner posts. The device is very simple and inexpensive and may be readily attached to any post. In our illustration, we show in Fig. 1 the construction applied to the ordinary fence

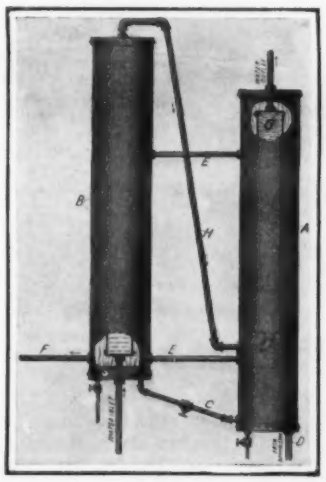


FENCE POST ANCHOR.

post, while in Fig. 2 is shown the construction used for corner posts. In both illustrations the post is designated by the letter *A*. At the bottom of the post is an anchor plate *B*, which at one end is flattened out to form a blade *C*. The opposite end of the anchor plate is doubled upon itself to receive the lower end of a diagonal brace *D*, the upper end of which is bolted to the post. An angle brace *E* is secured to the opposite side of the post, and connects it to the anchor plate *B*. The spikes which pass through the anchor plate are long enough to be driven to a considerable depth in the ground, and serve as additional means for preventing the anchor plate from sliding out of position. In use a trench is dug at the point where the post is to be erected. The trench is just wide enough to receive the anchor plate *B*, and the blade *C* of the plate is driven into the undisturbed ground at the end of the trench, thus affording a firm anchorage. Thereafter the post is erected on the anchor plate, and the braces *D* and *E* are bolted fast. For corner posts, the anchoring device is used in duplicate. The blades *C* of the anchor plate are driven into the ground at the side, where there will be a lifting strain imposed by the tension of the fence wires. The inventor of this anchoring device for fence posts is Mr. Julius Laux, of Flatonia, Texas.

AMMONIA PURIFIER FOR REFRIGERATING PLANTS.

A recent patent discloses an improved method of purifying ammonia, so as to render it anhydrous in refrigerating plants. The object is to produce a high grade of anhydrous ammonia continuously while the compressor is in operation. An apparatus is provided which is connected in circuit with the compressor and condenser, and removes a portion of the heat from the compressed ammonia so as to condense the oil and water vapor and permit dry or partially cooled but uncondensed ammonia to be delivered to the condensing coil. In this way the amount of cooling that

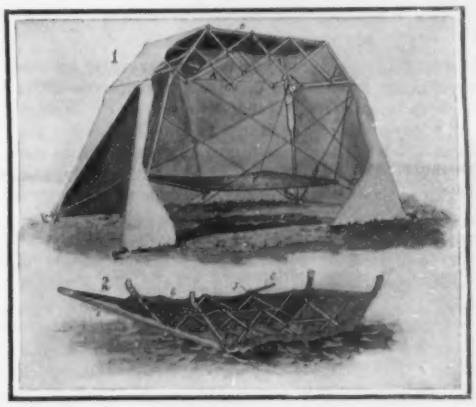


APPARATUS FOR PURIFYING AMMONIA FOR REFRIGERATING SYSTEMS.

is required in the condenser is reduced. The passage of oil to the condenser is prevented and the ammonia is condensed separately, so that only pure anhydrous ammonia is delivered to the expansion valve. The apparatus comprises two holders or drums *A* and *B*, which are connected at the bottom by a pipe *C*. The drum *B* is preferably raised above the drum *A*. The compressed ammonia enters the drum *A*, through a pipe *D*, then passes through one or more connecting pipes *E* to the drum *B*, after which it passes out through the pipe *F*. The cooling system consists in a pair of water chambers *G* and a pipe *H*, connecting the top of the water chamber in drum *B* with the bottom of the chamber in the drum *A*. The water passes through the cooling system in the reverse direction to the flow of ammonia through the apparatus. The temperature and rate of flow are so controlled that there will be no condensation of ammonia in the gas holders, but all the oil and water vapor which may be carried along with the ammonia will be condensed in these holders and accumulate in the lower portions. If the valve in the pipe *C* is opened, the oil and water will flow into the bottom of the drum *A* and may be drawn off at that point. The object of letting the pipe from the compressor pass up through the oil and water in the drum *A* is to heat the oil and thus prevent as far as possible the loss of ammonia. The inventor of this apparatus is Mr. Lawrence Wagner, of Missouri Avenue and Missouri Pacific Tracks, Sedalia, Missouri.

CONVERTIBLE BOAT AND TENT.

For the benefit of campers, hunters, and the like, a folding tent has recently been devised which may be packed into a very small compass and which may also be converted into a canvas boat. Our illustration shows the device in its two forms, partly broken away to reveal the framework. It will be observed that the upper portion of the tent comprises a pair of lazy tongs *A*, connected by cross bars *B*. These are supported on four posts indicated at *C* and *D*, and the structure is rendered quite rigid by means of a system of guy wires. Swung from the framework are a pair of bars *E*, which support a hammock *F*. The upper portion of the tent frame is covered with waterproof canvas, and in addition to this, there is a lower canvas section which may be fastened to the upper section by means of buttons, thus forming a spacious tent, and the occupant can sleep on the hammock,



CONVERTIBLE BOAT AND TENT.

which is a decided improvement over using the ground for a bed. When breaking camp, the posts *C* and *D* are withdrawn from their sockets, and the lazy tongs are folded up, so that the entire framework of the tent may be placed in a small bag. To convert this framework into a boat, it is extended and inverted, so that the cross bars *B* form the bottom of the boat. The bars *E* of the hammock are hooked to the framework at one end, and fastened together at their outer ends to form a bowsprit for the boat. The bowsprit is braced by a pair of arms *H*, which are hinged to the cross bar *G*. It will be observed that the lazy tongs at *J* are extended to form oarlocks, and the posts *C* of the tent are so constructed as to form oars. The seat of the boat is supported on a pair of longitudinal beams *K*. The canvas top of the tent is applied to the framework, inclosing it and thus forming a flat-bottomed canvas boat of large capacity. Mr. Joseph Vaghi, of Bethel, Conn., has just secured a patent on this convertible boat and tent.

INDEX SYSTEM FOR POCKET MEMORANDA.

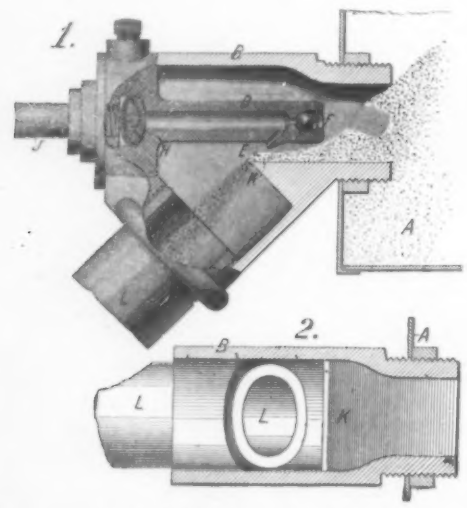
A patent has recently been granted on an improved pocket memorandum book, which is provided with a novel indexing system. The first leaf of the book is shorter than the others and serves as a topic list, being ruled to allow of entering various topics on which notes are to be kept. The other leaves of the book are cut with series of tabs, as shown in the illustration, the tabs on each leaf corresponding in number to the topics provided for in the topic list. When notes on a subject are entered on one of the leaves of the book, all the tabs of this leaf except that opposite the topic to which the notes relate are cut away. When a leaf is filled, it may be removed and filed away in a card index. If it is desired to permit the leaf to remain in the memorandum book after it has been completely filled, the tab is partially cut away so that it will still serve to locate the leaf but will not interfere with the thumb in readily finding the next tab underneath in the same series. In this way, the entire memandum book is so arranged that the matter it contains is always properly indexed, and may readily be referred to whenever desired. Furthermore, the material is so placed and the leaves are so arranged that when they are removed and filed

MEMORANDUM BOOK WITH NOVEL INDEX SYSTEM.

in a card index no transcribing of the notes is necessary. The device should be of particular advantage to the modern farmer, horticulturist, gardener, or stock man, who must have some convenient way of collating and preserving the data of his daily work if he is to get a full measure of profit and satisfaction out of his experience from year to year. He cannot afford to trust his memory with much important detail, and an elaborate system of keeping a record does not appeal to him. The pocket memorandum book with topical index should meet his needs. The inventor of this memorandum book is Mr. E. A. Bagby, 1107 Brook Street, Louisville, Ky.

IMPROVED TRACK SANDER.

Pictured in the accompanying engraving is an improved track sander for use with locomotives. The apparatus is so arranged that two jets of compressed air are employed, one of which is directed against the sand in the sand box, serving to agitate it, while the other acts to discharge the same continuously and smoothly. Special precautions are taken to prevent the nozzles from being clogged with sand. In our illustration the sand box is indicated at *A*. The sander casing *B* is substantially of Y form. It is threaded into the sand box and held in place with a lock nut. At the opposite end of the casing is a plug *C*, provided with an extension *D* constituting the nozzle. At the extreme inner end of the extension *D* the bore is constricted to form a jet opening, which communicates with a recess in which a ball *F* is placed. In addition to this, there is an inclined jet opening *E*. At the opposite end of the plug there is a screen *H*, which serves to strain the compressed air that enters by way of pipe *J*. In the other leg of the



IMPROVED TRACK SANDER.

Y-shaped casing is the pipe *L*, which leads to the point at which it is desired to discharge the sand. Within the casing, and extending partially over the passage leading to pipe *L*, is a shelf *K*. In operation, when compressed air is admitted to the nozzle, it forces its way past the ball *F* into the sand of the sand box *A*. A portion of the air is directed backward to the jet opening *E*, producing a partial vacuum, which causes the sand that is agitated by the other jet of air to flow along the shelf *K*, and thence be carried down the discharge pipe *L*. The ball *F* prevents the constricted opening in the nozzle from being clogged with sand, and this constricted opening serves to reduce the fluid pressure by permitting its expansion past the ball *F*, so that a destructive sand blast is avoided thereby. The inventor of this improved track sander is Mr. John Henry Watters, of Augusta, Ga.

BRIEF NOTES ABOUT NEW INVENTIONS.

The "singing sign" which has been recently placed in front of a Denver business house is a visual as well as audible means of attracting the attention of passers-by. The particular sign referred to displays the word "Dentists," and is of the electric flashing type. The illumination of one letter follows the other, and as the lamps comprising each letter are flashed, a wooden hammer strikes one of a group of orchestral chimes. There is a different bell for each letter, and the chimes represent a complete octave. The combination of sounds may be varied at will with but little trouble.

The illuminated elevator threshold is a new means to prevent what is a quite common form of elevator accident. The elevator attendant, making hundreds of stops in the course of a day, is not always enabled to bring the car to a halt at the exact floor level, and a very slight variation is sufficient to give the passenger a jolt if not more serious injury. The floor of the car being held an inch or two above that of the building is likely to trip the unguarded person about to enter the car, while persons stepping out are liable to be thrown down. The latest method of avoiding this is the insertion of a pair of plate glass lenses in the metal of the threshold, with an incandescent lamp under each. These are kept in operation all the time the car is in use. The lamps are supplied through the elevator cable in the same manner as the overhead lamps. This device has been tried with eminent success in some moving-picture establishments, where the rear seats are slightly above the level of the aisle floor.

The jobbing carpenter moving around from one place to another, and locating for a few days at a time in one spot, in the course of his peripatetic career is compelled to spend considerable of his time in the construction of wooden horses or trestles, which are generally so necessary for his work. These things are of such an awkward shape and size that it is out of the question to carry them from point to point, so he is compelled to build them in many cases before he can proceed with his work. To meet such demands, horses of steel with collapsible legs have recently been made, so that they may be readily packed up and carried from place to place. The legs fold over on the back of the trestle when not in use and when being transported, and in this form they are very compact. Being of angle iron, the trestle is not heavy and is almost everlasting.

ODDITIES IN INVENTIONS.

Hat Fastener.—The recent agitation against long hatpins has set a Yankee inventor to thinking. He has arranged a hatpin which has no exposed point and which does not have to be removed from the hat, but which may be operated to engage the hair by giving it a half turn. The hatpin extends from side to side of the crown of the hat, and is provided

A NOVEL TYPE OF HATPIN.

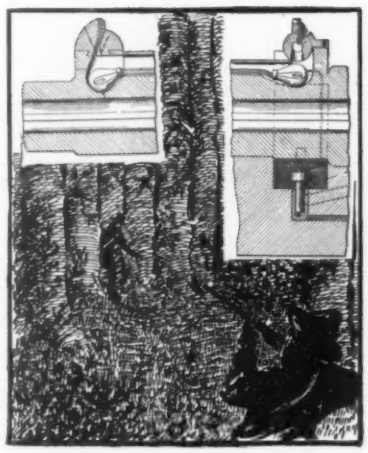
with a series of hooks or grapples sharply pointed at the ends, so that when the pin is turned they will hook into the hair. Whether the hat fastener has been tried in actual practice we do not know, but it seems as if there would be considerable danger of entangling the hair in the curved hooks.

Device for Drawing on and Removing Overshoes.—An inventor does not have to go far afield for objects upon which to exercise his inventive faculties. Even in the most commonplace matters of everyday life there is room for improvement. Take, for instance, the method of removing one's overshoes; the usual way of teetering on one foot while trying to kick the shoe off the other foot is most awkward, to say

DEVICE FOR DRAWING ON AND REMOVING OVERSHOES.

the least. Recently, an inventor has devised a little attachment for the cane or umbrella, whereby one can stand firmly on one foot and steady himself with the umbrella while removing the overshoe by pressing the lug at the back of the overshoe against the attachment on the umbrella. The inventor has provided a more elaborate device to hold the overshoe in place while drawing it on. The lug at the heel of the overshoe is so formed that it can be engaged between a pair of jaw clamps, one of which is fixed while the other is spring-actuated. The device is applicable to a cane, and running from the movable jaw to within a convenient distance of the head of the cane is a rod, which may be lifted to release the jaws.

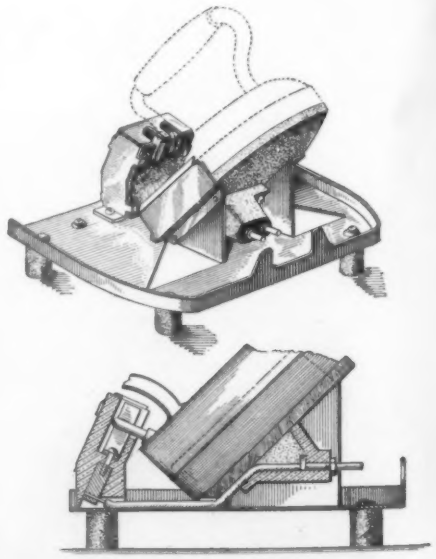
Luminous Gun Sights.—When using a gun in the dark or deep twilight, it is very difficult to secure accurate aim, because the sights are invisible. This difficulty has frequently been experienced by sentries,



LUMINOUS SIGHTS FOR TWILIGHT SHOOTING.

who should be able to cover an approaching enemy with accuracy, in order to secure their own safety as well as that of the camp. To enable this to be done, an inventor has recently devised a gun in which the sights are luminous. This is effected by means of a pair of small electric lamps lighted by batteries placed in the stock of the gun. The sectional views in the accompanying cut show how the lamps are arranged. The sights are formed with prisms, which at their lower ends communicate with chambers in which the lamps are located. The lamps are lit only when the trigger is partially pressed, so that it is not necessary for the sentry to expose his whereabouts until he is ready to fire. The sights are of such a nature that they may be used in the daytime with the lamps disconnected, a switch being provided for opening or closing the lamp circuit.

Support for Electrically Heated Flatirons.—A novel support has recently been invented for electrically heated flatirons. It is so arranged that the current is turned on only when the iron is on the support. The support consists of a metallic base provided with legs of insulating material and upon which is mounted, in inclined position, a plate of slate. On this the flatiron is adapted to be supported, so that the head of the flatiron will slide down and bear against a block of insulating material at the rear of the base. In this block are two sockets, provided with metallic clips forming the terminals of an electric current. The flatiron, which is provided with the usual heating coils, has two terminal pins near



SUPPORT FOR ELECTRICALLY HEATED FLATIRONS.

the heel. These are adapted to engage the clips when the iron is in position on the slate. This completes the circuit through the coils, and serves to heat the iron. As soon as the iron is removed from the stove, the circuit is broken, and there is no waste of current or dangerous overheating liable to cause a fire.

RECENTLY PATENTED INVENTIONS.

Electrical Devices.

TELAUTOGRAPH INSTRUMENT.—A. L. GOLDEN, Oakland, Cal. This instrument is for use in copying written matter or drawing by electro-magnetic means. An object of the invention is to provide a device by means of which a person at one station may write a letter, sign his name or execute a drawing, which a similar device will reproduce at another station in the form of an exact duplicate.

Of Interest to Farmers.

SIX-HORSE DRAFT MECHANISM.—H. MESSMAN, Kentland, Ind. This invention has reference to draft mechanism or draft gear enabling a number of horses or similar draft animals to be attached to a plow or other implement, and provides a construction which will equalize the leverage and pulling force exerted by the different animals.

GRAIN SPREADER AND FEEDER.—A. CLARK, Portland, Ore. The improvement relates to a device applicable to the feed or supply table of threshing machines and machines of a like type, being especially designed for use in connection with the feeding of headed grain, which, even under the most favorable conditions of service, frequently "slug" the cylinder.

CHURN.—W. F. S. SMITHDEAL, Salisbury, N. C. In general the invention may be defined as consisting of a pyramidal frame having headblocks spaced apart, the blocks having slots in vertical alinement entering the edges from one side of the frame, a hand-lever fulcrumed at the opposite side of the frame and having a cross arm, a dasher shaft, removably journaled in the slots and having a belt wheel and a belt detachably connected to the arm and passing around the wheel.

Of General Interest.

COMPOSITE BEAM STRUCTURE.—W. P. FRANCIS, Pensacola, Fla. Among the principal objects here is to provide a construction wherein is combined the tensile strength of metal formation with the immobility of masonry; to provide a composite structure of metal and masonry whereby the metal members are arranged in truss form; to provide a fireproof construction for a carrying beam.

LINE-CLINOMETER.—E. H. HOLDEN, New York, N. Y. This improvement comprehends a line clinometer provided with a telescope and a level associated therewith, the telescope being adapted to turn in a substantially vertical plane, and means including a vernier and a level for measuring the extent of inclination of the telescope from a given real or imaginary line.

ELECTRIC FURNACE.—H. W. HIXON, Philadelphia, Pa. More particularly this invention relates to those furnaces used in the smelting of zinc ores. An object is to provide a furnace in which the zinc is fed in at the top, which is kept closed by means of a top of double construction so arranged that an upper door may be opened and a charge fed in while the lower door is shut.

Hardware and Tools.

PADLOCK.—A. M. H. DE BRUYCKER, New York, N. Y. This invention relates to locks having a main bolt formed of hook members, such, for instance, as shown and described in the Letters Patent of the U. S., formerly granted to Mr. De Bruycker. The aim is to provide a padlock having both sides of the hasp notched for engagement by the hooked members of a bolt, actuated by key-controlled means.

NAIL-HOLDER FOR HAMMERS.—H. SCHNEIDER, New York, N. Y. The holder is arranged to hold the nail and to start it prior to driving the nail home, and to readily accommodate nails of different length. For this purpose the head of the hammer is provided with integral abutments located different distances from the face of the hammer head, and retaining means in alinement with the abutments for temporarily holding a nail, the head of the nail abutting against the corresponding abutment.

Heating and Lighting.

SHOCK-ABSORBER FOR TUNGSTEN-LAMPS.—F. SCHWARTZ and L. KLEINMANN, New York, N. Y. This invention is particularly useful in connection with electric lamps such as tungsten lamps having fragile filaments. The purpose is to provide a hanger having a shock-absorbing device for supporting the lamp, which will operate to prevent the transmission of a jar or shock to the lamp, which might be otherwise transmitted from the ceiling or wall.

CANDELABRUM.—C. YOOS, New York, N. Y. This candelabrum is such as used in churches, chapels and similar places where candles are left burning continuously. A special construction operates to bring about a complete consumption of the candle. The invention resides partly in the nature and form of the bobache or cup which supports the candle. The construction is such as to prevent the accumulation of wax or candle grease upon the parts.

Household Utilities.

TRAP.—M. L. FRENCH, Onida, S. D. In this patent the invention relates to traps for use in catching insects, and resides more particularly in a trap for flies and the like, comprising apertured screens adapted to entrap the insects, and so constructed as to permit of the same being removably used on screen doors, window screens and like protections.

WASHBOARD.—D. STEIN, New York, N. Y. This improvement relates to metal washboards. In this board the inventor forms the entire frame, that is, the side bars and the top or transverse member, all of a single piece of channel iron, and the width of the groove in the channel is such that the corrugated metal rubbing surface is firmly held therein. The board is reversible.

MOP-HEAD.—W. H. ZACHRY, Atlanta, Ga. In this device the improved head is simply constructed, is efficient, and all the operative mechanism is concealed by the cover plate. When not in use the parts may be separated, to permit the threads to dry, thus preventing rust, and increasing the longevity of the head. As an article of manufacture, the device could possibly be marketed without the handle.

Machines and Mechanical Devices.

APPARATUS FOR BEADING OR TURNING OVER BOILER-TUBES.—H. E. A. GALLON, 22 bis Rue du Cours, Sotteville-les-Rouen, France. This improved apparatus, contrary to those of former invention, enables work to be done on plates which are out of shape and in oval holes without any trouble, to obtain different sections of flange on tubes which may be of different diameters and of producing on the work rolling forces which are capable of insuring perfect connection of surfaces which are to maintain damaged tube-plates fluid-tight.

CUE-TIPPING MACHINE.—G. MAHONEY, Iowa City, Iowa. This machine is for use in forming and trimming the tip of a cue or the like. The device is easily manipulated, and quick and accurate in its operation. It consists of a plurality of cutting, trimming and filing wheels, driven by a suitable means and juxtaposed to suitable work-supports or rests.

CLOTH-CUTTER.—M. LANGMAN, New York, N. Y.—The purposes here are: To keep the blade constantly sharp by operating upon it for this purpose while it is in action cutting cloth. To throw the sharpening mechanism out of working relation at the will of the operator without moving it from the blade and parts associated therewith. To provide various details of construction for improving the general efficiency of cloth cutters.

COIN-DIRECTOR FOR VENDING-MACHINES.—W. ASBURY, New York, N. Y. The object of this invention is to provide a coin director disposed in the coin chute of a vending machine, which will alternately direct coins in opposite directions. An object is to provide means which will permit coins of less than predetermined diameter to pass through an opening in the coin chute so that they will not engage the coin director.

Prime Movers and Their Accessories.

STEAM-GENERATOR.—I. WICHROWSKI 622 Myrtle Avenue, Brooklyn, New York, N. Y. This device has a flat rectangular partitioned compartment disposed directly over the furnace, with communication in the partition, one compartment subdivision for use as a superheater, there being a steam dome in communication with the former and a water supply in communication with the boiler, the boiler being disposed over the flue, which has a continuation which is disposed in the steam dome. A valve is provided in the communication between the superheater and steam dome. The inventor gives information that steam generates rapidly on high pressure and temperature. It is particularly adapted for steam turbines.

STEAM-TURBINE.—T. FALVEY, London, England. This invention relates to improvements in turbines of the kind previously invented by Mr. Falvey wherein the rotor consists of a disk carrying upon one of its faces concentric annular series of tangentially inclined vanes which alternate radially and are adapted to co-act with similar series of vanes reversely inclined, carried upon the opposed face of the stator of the turbine, the steam passing radially outward through the successive series of vanes into a peripheral exhaust channel in communication with the exhaust pipe.

SAFETY-GATE.—E. KRANCHER, New York, N. Y. This invention relates to safety gates, suitable more especially for use upon cars and similar railway vehicles, the more particular purpose being to prevent persons from passing from one car to another while the train is rounding a curve, or at least to warn such persons of this danger.

DEPOSITING-BOX AND TIME-STAMP.—C. A. NAUCK, Little Rock, Ark. This invention has reference to time recorders, and its object is to provide a new and improved depositing box and time stamp, designed for use in receiving articles such as envelops filled with transfer tickets as used by railways, the device providing the article stamped indicating the time of day or night, and depositing the accumulated articles in a box for convenient removal after a day's work.

COUPLING FOR AIR-BRAKE PIPES.—L. A. PETERSON, Hannaford, N. D. The improvement relates to means for reliably coupling together the sections of an air-brake supply pipe that extend from car to car throughout a train, and particularly to such appliances as are provided for conveying air under pressure to the air-actuated brakes of a train of freight cars.

Railways and Their Accessories.

TRAIN-ORDER HOLDER.—A. W. VICK, Savannah, Ga. This device is of book form, having means to retain the orders stretched out of the inner side of either cover and present the same, when the holder is open, in a visible and accessible position, thus avoiding the handling, folding and careless pocketing of the orders by trainmen and insuring a careful and frequent reading of the orders, the holder being preferably removably supported on a bracket, with the latter arranged to cause the covers of the holder to swing apart and remain open when the covers are unlatched.

Pertaining to Recreation.

AMUSEMENT DEVICE.—J. J. TREANOR, New York, N. Y. More specifically the invention relates to an amusement device having movable hurdles or obstacles, and means for actuating the same so that a child can jump or skip over the hurdles as these travel, thereby providing a substitute for the ordinary jumping or skipping rope.

Pertaining to Vehicles.

RUNNING-GEAR FOR VEHICLES.—D. H. MASTERS, Cliff, New Mex. The details of construction for the running gears, more particularly for automobiles, adapt said gears to reliably coöperate for swinging the ends of both axles simultaneously an equal degree toward each other at one side of the vehicle, and correspondingly diverging their opposite ends at the other side thereof, whereby full control of the turning either side thereof is insured, and danger due to loss of control is avoided.

Designs.

DESIGN FOR A CIGAR OR CIGARETTE HOLDER.—A. Q. WALSH, New York, N. Y. This design includes two figures of a holder. Both are ornamented their entire length beyond the mouth end by an attractive plant and flower design. The particular difference is in the mouth ends of the holders, one being rather straight and slightly flattened, and the other narrowed into a bottle neck shape and then broadening at the orifice of the mouth end.

DESIGN FOR AN ORNAMENT FOR GARMENTS.—A. IRELAND, New York, N. Y. This ornamental design represents a long-bodied animal without limbs of any kind, the body tapering from a very bushy head to the tail, which spreads out at the end.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Kindly write queries on separate sheets when writing about other matters, such as patents, subscriptions, books, etc. This will facilitate answering your questions. Be sure and give full name and address on every sheet.

Full hints to correspondents were printed at the head of this column in the issue of March 13th, 1909, or will be sent by mail on request.

(12228) E. A. P. says: Does an article weigh the same at the equator as at the poles of the earth? If not, why not? How much difference would there be? A. For two causes a body will weigh more at the poles than at the equator. One is that it is nearer the center of the earth; the other is that the rotation of the earth on its axis lightens bodies at the equator, but not at all at the poles. This is called centrifugal force. The weight of a body at the poles is 983/978 of its weight at the equator, or about 5 pounds in 1,000 pounds.

(12229) W. H. B. says: To photograph the vibrations of the diaphragm of a phonograph by a narrow beam of light thrown on a photographic film, say one-half inch in width, contained on two spools and moving in unison with the phonograph, said film to be afterward developed and then used as a reproducer on a photographic machine, the wires of which have a small selenium connection, and a narrow beam of light being thrown through the film of the selenium and connected with the ordinary telephone reproducer. The vibrations could be photographed in a number of ways. A small mirror could be fastened to the phonograph and reflect the beam of light on the film. A diaphragm could be made so that it would open and close in unison with the vibrations. In fact, there are a great many different ways, as I have said before, in which this could be accomplished, but whether the vibrations would be of such a nature, or the celluloid film pure enough, so that the interruption of the electric currents produced by the light shining through these vibrations would make a practical instrument, is beyond me without working it out. The drawbacks to the present phonograph are the shortness of the record and the scratching of the needle. If it were possible to transfer the vibrations of sound into light and photograph them on the film, as I have stated above, the period of the phonographic record could be greatly lengthened, and of course there would be no scratching from the needle itself. A. We should not dare to say that a photographic film could not reproduce sounds, but it does not seem to us to be probable that it could do so. It would seem to us almost certain that selenium could not vary rapidly enough to produce a record of a sound. Certainly, if a mechanical shutter were worked fast enough to be in unison with the vibrations, the shutter would emit the same tone as the sound, and it is not obvious how a shutter could change its rate of opening and closing, to keep in unison with all the tones of the sounds. There is a phonograph which employs magnetism and magnetizes a rapidly moving wire, so that it will reproduce speech or music, which has been said or sung into it, most perfectly, and without any rasping or disagreeable sounds such as all other phonographs have. A length of wire can be used which will permit a whole discourse of an hour to be taken upon it.

(12230) A. M. asks: While I was in New York a few years ago, taking in the statue of Liberty, I was told that the copper sheathing of the statue was insulated from the steel framework to protect the one metal from the other in some action of destruction. I have noticed that some lightning rod manufacturers use a combination of steel and copper, and the thought struck me that the same destruction would occur in such rods. Will you be kind enough to explain what action causes the destruction, and to what extent? A. Copper and iron are two metals between which an electromotive force is set up when they come into contact with each other, producing an electric current. This current causes an eating away of one of the metals, and thus the statue of Liberty would be gradually destroyed if the copper sheets were riveted directly to the iron framework. The action is very slow, but the statue was intended to endure for a very long time. The joints of a rod of these two metals would in time become loose for the same reason. This process is called electrolysis.

(12231) J. L. B. asks: Will you please tell me how to transform a 110 volt alternating current to a direct current of 8 or 12 volts? I wish to use the electric light current in my house to ring door bells and to operate small motors. A. You will find the descriptions of rectifiers in our SUPPLEMENTS 1748 and 1644, price ten cents each. One of these will give you direct current for ringing a door bell.

(12232) A. R. K. says: Will you please tell the difference in the quality or character of the primary and secondary current of the induction coil? The current seems to be intensified or augmented, but what in volts, amperes, or electromotive force? Would the secondary current operate an electro-magnet? A. In an induction coil, such as is used for producing sparks or working X-ray tubes and wireless telegraph apparatus, the primary current is of low voltage and is interrupted many times a second. It is an interrupted direct current. The secondary coil has a current of much higher voltage, and if the terminals are quite a distance apart, and a condenser is used, the secondary current is also always in the same direction. The terminals of the secondary are plus and minus, but do not change their sign unless the direction of the primary current is changed or reversed. The secondary current will not usually operate a motor, nor can it be used on an electro-magnet.

(12233) G. T. says: Why is it that the winds are not utilized as a source of power for practically all purposes? Why, for instance, could I not light and heat my house with electricity derived from the force of the winds? A. There is no reason whatever why you should not heat and light your house with wind power if you had enough wind and enough plant. The only reason why windmills are not more so used is that there are few places where wind is sufficiently constant to provide continuous power, and if no auxiliary engine is used to run the plant when there is no wind, the capacity of both windmill and generator must be greatly in excess of normal requirements in order to generate enough power when the wind blows to serve for longer periods of calm. The storage battery capacity must be also very great. Probably the most convenient and cheap way is to have a large tank (in an attic or the top of a barn or on a hill) of capacity sufficient to run a water motor driving the generator for three or four days at least and a windmill pump of sufficient capacity to fill the tank in a day's continuous pumping or less.

(12234) F. L. P. writes: I know that a person has more or less electricity in him, but I have a question about myself. I am a school teacher. When writing on an ordinary plaster blackboard, I generally receive an electric shock and a snap is heard. My classes recite in different rooms, and this occurs in two but not in the third. It occurs in two rooms that are adjoining, but always on the south walls only. Could it be defective wiring in our lighting system? Could defective wiring give that kind of a shock? Is plaster a good conductor? Isn't it rather a poor conductor? I am generally able to discharge it

at the second touch, if not the first, and do not always notice it at the first touch. In opposition to the defective wiring: I have been able to find no one else in the class who ever notices the same thing, although they can see me draw back my hand when I receive the shock. Again, I have noticed the shock and heard the snap when I passed something, say a pencil, from my hand to that of a student. A. It is doubtless true that some persons can generate sparks of electricity more easily than others. You seem to be one of those who have that power. We have always supposed that it was due to an unusual dryness of the skin, so that the friction of the feet on the carpet or floor produced electrification to an unusual degree. It is not uncommon in cold dry weather for a person to feel a slight pricking from a spark of electricity when he touches a wall or some object. People can light a gas jet in that way. We should not say that people have electricity in them any more than the earth has electricity in it. Electricity or the ability to become electrified is common to all things. Insulate anything and it can be electrified. It is not necessary to suppose that the electric light wiring has anything to do with the phenomena. If that were defective, you would have trouble with the lights.

(12235) W. H. McF. says: Kindly explain how an engine makes a curve, when the outside rail is longer than the inside. A. When an engine on rails rounds a curve, centrifugal force carries it toward the outer rail to some small extent, causing the wheels, which are tapered or cone shaped, to run on a larger circumference on the outer and a smaller circumference on the inner rail. The tapering of the wheels is not, however, sufficient to provide for all the differences between the length of the inner and outer rails, and has lately been reduced, and the remaining difference is overcome by the slip of the inner wheels on the rail when the pressure of the outer wheels is greater.

(12236) J. F. says: Could you give me a plain rule or formula for computing the time of rising and setting of the sun, moon, and stars, through your Notes and Queries or otherwise, or refer me to a book that contains such a rule or formula? A. The times of the rising and setting of the sun, moon, and stars are found from spherical trigonometry, using the latitude of the place and the declination and right ascension of the heavenly body whose times are to be computed. We do not know any short method for getting the result. The methods are briefly given in Young's "General Astronomy," which we send for $3, post paid.

(12237) H. C. M. says: Will you kindly give me information on the following point? Is it possible, and if so by what formula, to compute the volume of a gas passing through an aperture of known size, having given the density of the gas, its pressure, and the pressure of the atmosphere into which it is discharging? A. The theoretical velocity in feet per second of the flow of gas (or any fluid or liquid, through an orifice is $v = \sqrt{2gh} = 8.02\sqrt{h}$, in which h equals the head or theoretical height of a column of the fluid in feet required to produce the pressure of the fluid at the level of the orifice. $H = \frac{v^2}{2g}$

The quantity of flow in cubic feet per second is equal to the velocity multiplied by the area of the orifice in square feet and also multiplied by a coefficient of flow which takes into account the *vena contracta* of the flowing stream and the friction of the orifice, etc. Dr. Julius Weisbach gives the following coefficients for flow from a vessel of pressure $p1$ into a reservoir or atmosphere of pressure $p2$ for circular orifice of 1 centimeter diameter: Where the ratio $p1 \div p2$ is 1.05, 1.09, 1.43, 1.65, 1.89, 2.15,

Coefficient of flow is 0.555, 0.589, 0.692, 0.724, 0.754, 0.788.

(12238) N. V. says: 1. I would like to have a copy of the naval telegraph code. A. We would suggest an application to the Secretary of the Navy for a copy of the naval telegraph code. 2. How many batteries (dry) to run a 10 candle-power incandescent lamp? A. We cannot tell you how many dry cells will be required to run a 10 candle-power incandescent lamp. Take enough to furnish the voltage in series at 1.4 volts per cell, and as many series as will bring the lamp to full brightness. 3. Can you tell me how to prepare woods for collections (showing a cross-grain face, a bevel face, a longitudinal face, and bark)? A. Woods are prepared for museum collections by sawing the sections as you describe and smoothing them carefully to bring out the grain. One-half of each part is usually varnished to show its appearance when polished.

(12239) J. N. L. asks: As your paper is on our files here, I take the liberty of submitting a bet that has been made here for your decision. A bets that at the equatorial line the sun rises and sets at 6 A. M. and P. M. B bets that the changes in time vary same as here in Hawaii. A personal note as to who wins this bet will greatly oblige. A. We do not decide bets. Our Hints to Correspondents have for a long time stated this plainly. We will say that as viewed from the equator of the earth the poles of the heavens are upon the north and south points of the horizon. All circles of daily motion are perpendicular to the horizon and are bisected by the horizon. Every heavenly body is half of the day above the horizon and half of the day below the horizon. Perhaps you can tell from this at what hour of the day the sun must always rise and set as seen from the equator.

NEW BOOKS, ETC.

RHODES'S DIRECTORY OF PASSENGER STEAMERS. London: George Phillip & Son, Ltd., 1910. 12mo.; 387 pp. Price, $1.

This is a very valuable book for all who are interested in any way in shipping. It gives a list of companies with the names of the vessels under each; then comes a directory of passenger steamers, giving the length, breadth, depth, horse-power, etc., of all vessels. The writer has found this book of great value in comparing tonnages and horse-power in disputed questions which have arisen. There are a number of excellent illustrations in the front of the book. The book is printed on light-weight paper, rendering it very convenient for reference. It is attractively bound.

THE HISTORY OF THE LOGARITHMIC SLIDE RULE AND ALLIED INSTRUMENTS. By Florian Cajori, Ph.D. New York: Engineering News Publishing Company, 1909. 12mo.; 126 pp. Price, $1.

Of the machines for minimizing mental labor in computation, no device has been of greater general interest than that of the slide rule, and few instruments offer a more attractive field for historical study. The present monograph deals with the history and development of the slide rule in various countries. There is too a complete list of all the slide rules designed and used since 1800, there is also a bibliography of books on the slide rule, and altogether the work is a most interesting one. The author is to be congratulated on the production of a unique book.

THE ENGINEERING INDEX ANNUAL, 1909. Compiled from the Engineering Index, published monthly in the Engineering Magazine during 1909. New York and London: The Engineering Magazine, 1910. 8vo.; 471 pp. Price, $2.

For the past twenty-six years the Engineering Magazine has been publishing a valuable index of engineering and technical literature, and for the last four years the Index has appeared annually. In the present volume the classifications have been amplified and cross references freely used to assist a person in finding the literature he desires. The index covers a long list of periodicals, three-fourths of which are printed in English, while the others are German, French, Spanish, Italian, and Dutch. A brief description is given in each case to define the scope and purport of the article.

TECHNISCHER FUEHRER DURCH WIEN. Herausgegeben vom Oesterreichischen Ingenieur und Architekten-Verein. Redigiert von Ing. Dr. Martin Paul, Stadtbauinspektor. Wien: Verlag von Gerlach & Wiedling, 1910.

The general plan of this book seems to us most admirable. It starts with "The General Development of the City of Vienna," under which general title are discussed geology and climate, hydrography, building material, statistics and government, organization of the technical bureaus, technical and industrial societies, and city development. The second division, under the general title of Engineering Works, includes papers on traffic, postal, telegraph, and telephone service, streets and squares, drainage, water supply, illumination, bridges, water works, parks and cemeteries, abattoirs and provision houses. The third division, under the general title of Architectural Works, discusses the development of Viennese architecture within the last fifty years, buildings for art purposes, buildings of the imperial court, administration buildings, educational buildings, hospitals and asylums, military structures, club houses, museums, exchanges and business houses, exposition buildings. The fourth division, on plastic art and art collections, discusses monuments and public buildings, collections and libraries. Under the fifth and last division, the general industrial activity of the city is discussed.

THE FLOW OF WATER. D. Van Nostrand Company, 1909. 8vo.; 228 pp. Price, $3 net.

The present work is the outcome of a series of investigations begun several years ago with the object of finding a simple expression for the phenomenon of flow in irrigation channels. The author hopes that his work will prove of interest and value to the student and useful to the practical engineer. He also hopes that it will stimulate further research and thus tend to widen the field of hydraulic knowledge.

THE HISTORY OF THE TYPEWRITER. By George Carl Mares. London: Guilbert Pitman, 1909. 8vo.; 320 pp.

There are surely few people nowadays who are not acquainted with the typewriter, either directly or indirectly, but how many are aware that some three hundred different forms of writing machines have made a bold bid for public favor since the introduction of the first practical machine in the early seventies? In the "History of the Typewriter," in the compilation of which the author has been occupied for upward of five years, is presented for the first time in English literature a complete record of the invention and development of the writing machine. In the 320 pages nearly 300 machines are described with the aid of 220 illustrations—from the Mills typewriter of 185 years ago to the adaptation of typewriting to the uses of wireless telegraphy. In this volume the Beach typewriter, invented by the late A. E. Beach, comes in for a proper share of attention.

INSECT WONDERLAND. By Constance M. Foot. New York: John Lane Company, 1910. Price, $1.25 net.

The kind reception given to the author's little book entitled "Science Through Stories" emboldened the writer to choose for the subject of this volume some simple facts concerning the insect world, and she has selected one or more specimens of each of the seven great orders of the insect world according to the Linnean system of division.

THE CARE OF TREES IN LAWN, STREET, AND PARK. By B. E. Fernow. New York: Henry Holt & Co., 1910. 392 pp. Price, $2 net.

The author may be well said to be the father of forestry in the United States, and those who have followed him are very deeply indebted for the splendid foundation which he laid. The book belongs to the American Nature Series. Written for amateurs by a forester, this conveniently arranged volume furnishes information such as the owner of trees may need. Trees in place may be rendered almost imperishable by proper care and attention and the author gives details of the best methods of caring for the health of trees, transplanting, combating diseases and insects, etc. There are systematic and exhaustive lists of trees and shrubs fit for ornamental planting, with helpful notes on their adaptations.

IGNITION, TIMING, AND VALVE SETTING. By Thomas H. Russell, M.E., LL.B. Chicago: The Charles C. Thompson Company, 1909. 16mo.; 223 pp. Price, $1 in cloth, $1.50 in leather.

This is a comprehensive illustrated manual of self-instruction for automobile owners, operators, and repair men. The following are the contents: Electrical Ignition for Motor Car Engines, The Magneto System, Another View of Ignition, Magneto Ignition, General Summary of Ignition, Ignition Faults and Hints, Induction Coils, Timing Ignition, Valves and their Function, and Valve Setting.

INDIAN BIRDS. Being a Key to Common Birds of the Plains of India. By Douglas Dewar. London and New York: John Lane Company. 16mo.; 228 pp. Price, $2 net.

The object of this book is to enable those interested in Indian birds to identify them at sight. There are several good systematic works on Indian ornithology, but the systems presuppose that the reader has the specimen in his hand and is enabled to examine it leisurely feather by feather. To do this it is necessary to kill the bird in question, a procedure which gives pain to many and gives pleasure to very few. The method which the author employs is to classify birds according to their habits and outward appearance. Each bird has a color, and most birds possess some anatomical peculiarity, such as a crest, a long tail, long legs, etc. When the reader thinks he has located a bird, he should turn to the descriptive list which composes Part II of the book. This will serve to confirm or correct him in his identification.

OUR SEARCH FOR A WILDERNESS. By Mary Blair Beebe and C. William Beebe. New York: Henry Holt & Co., 1910. 8vo.; 408 pp. Price, $2.75 net.

This volume is an account of two trips made by Mr. and Mrs. Beebe into tropical wildernesses. The first was undertaken on a small Venezuelan sloop with which they penetrated far into the unknown Mangrove jungles, north of the Orinoco Delta, peopled principally by monkeys, Scarlet Ibises, and huge Anacondas. This trip ended at La Brea—the great lake of pitch—at a most critical time, when the American company had just been ousted by Castro and Venezuleans put in charge. The second search was in the Wilderness of British Guiana, where birds and animals, gold mines and Carib Indians all contributed continual interest and excitement. This pioneer exploration by an ornithologist and his wife reveals the tropics as far more delightful and bearable than the writings of most travellers would lead us to believe.

EXPORTERS' ENCYCLOPEDIA. 1910 Edition. New York: Exporters' Encyclopedia Company, 1910. 776 pp. Price, $5.

The Exporters' Encyclopedia is now in its sixth year and is recognized as a standard authority among export shippers, and has the strong indorsement of all the transport lines, manufacturers, etc., engaged in export trade. The "correction notes" are published in the Exporters' Review and are sent to each subscriber about the 15th of the month. This enables the book to be kept up to date until a new issue is ready.

A FORMULA BOOK OF ENGLISH OFFICIAL HISTORICAL DOCUMENTS. Part II. Ministerial and Judicial Records. Edited by Hubert Hall, F.S.A. Cambridge: University Press, 1909. 8vo.; 229 pp. Price, $2.50.

INDEX OF INVENTIONS

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Door stop, E. Vanoni 957,390
Dough molding machine, F. Streich 957,821
Draft equalizer, J. Van Matre 957,736
Draft equalizer, C. J. Bristol 957,185
Drag, horse, W. C. Braun 957,565
Drift bolt puller, J. A. King 957,264
Drinking cup, collapsible, M. Sholl 957,267
Drinking vessel, prophylactic, J. L. Sowell 957,279
Driving connection, flexible, S. M. Vauclain 957,801
Dyeing machine, Richardson & Neef 957,522
Dynamo driving, W. I. Thomson 957,218
Egg box, C. B. Kiefeker 957,192
Electric battery, F. A. Decker 957,506
Electric cable, R. F. Hall 957,337
Electric furnace, H. W. Hixon 957,209
Electric generator and motor, C. T. Hibbard 957,226
Electric heater, J. C. Logan 957,242
Electric machine, dynamo, J. E. Noeggerath 957,249
Electric machine, dynamo, W. D. Pomeroy 957,792
Electric meter, C. E. J. O'Keenan 957,547
Electric rosette, J. S. Crossley 13,114
Electric switch, E. M. Coffin, reissue 957,523
Electrical distribution system, W. A. Turbayne 957,523
Electrical distribution system, W. E. Winship 957,213
Electrical purposes, coil for, E. W. Jodrey 957,824
Electrically heated roller, G. H. Wade 957,535
Electricity meter, prepayment, H. Aron, 957,534, 957,879
Elevator, W. Reubold 957,707
Elevator freight compartments, door attachment for, Snyder & Custis 957,807
Elevators, interlock mechanism for, J. S. Muckle 957,702
Engine primer, gas, L. R. Dalrymple 957,500
Engine starting and stopping mechanism, internal combustion, J. B. Polo 957,372
Ester from chaulmoogra oil, L. Taub 957,633
Excavator, H. F. Menck 957,234
Explosive, C. P. H. Claessen 957,307
Extension table, R. M. Miller 957,236
Extension table, K. Kral 957,611
Extension table, J. B. Weeks 957,637
Eyeglass mounting, T. Rapp 957,374
Fan, ventilating, R. A. Ilg 957,776
Fastener for gloves and other articles, L. W. Brown 957,651
Faucet, Bown & Smith 957,647
Faucet for drawing liquids, G. Wegman 957,524
Feed water by exhaust steam from steam engines, apparatus for heating, J. Kerfoot 957,688
Fence post, J. M. Campbel 957,410
Fence post, C. T. Howell 957,677
Fence wire clamp, T. M. Cadle 957,302
Figure, jointed, G. W. Ferguson 957,666
File cabinet, rotary, C. & W. Liebert 957,784
Files and rasps, machine for producing, G. Pelseler 957,367
Filing cabinet, S. Klepfer 957,423
Filter bag, E. P. Dargin 957,191
Filter, vacuum, M. E. Hiltner 957,558
Filtering apparatus, D. J. Kelly 957,467
Fire escape, M. F. Welch 957,589
Fish net, D. P. Gilstrap 957,766
Flagstaff, Hendricks & Burnap 957,666
Flat foot, weak foot, or fallen arch of the foot, device for the correction of, F. C. Schumacher 957,718
Fluid pressure motor, H. B. Holt 957,339
Fluid substances, desiccating, A. G. Kalb, 957,849, 957,850
Fly guard, P. Kreuscher 957,425
Flying machine, W. W. Christmas 957,744
Forming machine, G. H. Petri 957,247
Frame. See Quilting frame.
Furnace arch construction, C. Campbell 957,494
Furnace feeder, L. P. Bolander 957,184
Furniture, article of, J. A. Ward, Jr. 957,826
Furniture support, adjustable, G. E. Anderson 957,176
Gage, J. M. Leaver, Jr. 957,779 to 957,782
Gambrel, hog, J. A. Kaiserlik 957,344
Game apparatus, A. W. Proctor 957,254
Game apparatus, J. R. Snow 957,266
Game apparatus, D. C. Mitchel 957,472
Game apparatus, E. J. Burke 957,740
Game board, H. A. Richardson 957,800
Games, artificial playing bed for open air, J. H. Stedman 957,387
Gapped wheel, W. T. Sears 957,384
Garbage receptacle, S. Moorman 957,237
Gas burner, E. Meyer-Zimmerli 957,358
Gas burner, automatic, R. G. Jamison 957,342
Gas burner controlling device, J. V. Wengelin 957,591
Gas generator, acetylene, O. W. Peterson 957,369
Gas generator, acetylene, S. A. Miles 957,698

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THE ACCIDENT TO THE "ZEPPELIN."

(Concluded from page 416.)

"Zeppelin IV." did not involve the loss of any life. The "Republique" catastrophe, however, was tragic. On September 25th, 1909, the craft dropped from a height of about 200 meters to the earth, and its passengers, Capt. Marchal, Lieut. Chauve, and the mechanicians, Vincennot and Reau, were killed immediately. The disaster was occasioned by the breaking of a propeller blade which flew off the shaft and pierced the gas bag.

The "Zeppelin II.," whose untimely end has been described, was taken over by the army last year, and made a member of the German airship fleet. The vessel took part in last year's airship maneuvers at Cologne, where it was stationed. In the spring of 1909 the vessel made a long journey from Lake Constance to Bitterfeld and return, remaining uninterruptedly in the air 38 hours, until it collided with a pear tree at Goeppingen, and was partially damaged. The "Zeppelin II." had a volume of 15,000 cubic meters. Its length was 136 meters, and maximum diameter 13 meters. Its maximum absolute velocity was 12½ meters a second, or 28 miles an hour. Its carrying capacity, including passengers and supplies, was 8,800 pounds. It was provided with two cars. The two motors of the airship developed each 115 horse-power. The total weight of the "Zeppelin" was about 23,100 pounds. The balloon frame, rigging and keel, balloon fabric, gas bags, stabilizing planes and meters, weighed 13,200 pounds. The seventeen gas cells weighed about 2,500 pounds.

Fire Control in the National Forests.

(Concluded from page 421.)

of way during the fire season, while the work of clearing the strips in a satisfactory manner, including the disposition of all refuse, is to be done by the railroads, but under the supervision of the Forest Service.

One of the most potent reasons why this agreement is a good one is the fact that the courts have decided the right of the Department of Agriculture to collect damages from roads running through National Forests for fires which they cause, and this fact is a strong inducement for the roads to join with the department in the effort to keep fires down.

Another strong factor is the fact that the Northern Pacific, being a land-grand road, owns considerable timber on the alternate sections along its line. The Great Northern, although it is not a land-grant road, also has property at stake in its buildings and the line itself, whose operation may be seriously interfered with by forest conflagrations.

The value of heavy timber in mountainous regions as a deterrent to avalanches, landslides, and floods is also to be considered. From the standpoint of far-sighted business policy, a still broader argument is the relations of the forests to the general welfare of the regions whose traffic the roads handle. Timber which goes up in smoke pays no freight tolls, and unchecked forest devastation means the enfeeblement of many industries dependent on wood and water.

Practical Sterilization by Means of Ultra-Violet Rays.

There seems to be little doubt, according to The Lancet, that the germicidal action of the ultra-violet rays will shortly be made available for the purposes of practical sterilization. In what exact way the ultra-violet rays act is not certain, but one view is that they produce ozone. Whatever the nature of the action may be, it seems clear that their application for the purpose of sterilizing articles intended for human consumption will eliminate the objection to the use of chemical antiseptics, the effect of which upon the human organism may be harmful. In an interesting paper which has reached us on the Sterilization of Water by Means of Quartz Lamps, by Dr. Max von Recklinghausen, it is stated that work on a very large scale has lately been done in France on this subject, and has developed the entire system of sterilization of different liquids used for alimentary purposes, based on the effect of the ultra-violet rays created in Cooper Hewitt lamps made from transparent quartz. The chief work in this line has been done by Prof. Henri in the Physiological Laboratory of the Sorbonne together with Dr. André Helbronner, who co-operated with Dr. Max von Recklinghausen with a view to developing an entire sterilizing system of the type described. The preliminary work was done by studying the action of the ultra-violet rays on different types of microbes and the influence of the different wave lengths. Dr. Roux of the Institut Pasteur, in which a good many of the experiments were made, presented to the Académie des Sciences some of the work done by the above cited scientists. Technically speaking, the results so far have been the development of a small water sterilizer for hospital use whereby 132 gallons of sterile water are produced per hour from ordinary city water by means of one Cooper Hewitt lamp, type "Silica," absorbing three amperes at 110 volts. Within a short time a very large sterilizing outfit, based on somewhat similar ideas, will be running, which will sterilize 3,500 cubic feet of water per hour, this being large enough to treat the entire water supply of a town of about 10,000 inhabitants. The installation of the lamp, it is stated, is a matter of no difficulty, all that is necessary being to connect up to the terminals provided in the dome top of the apparatus and to make the adjustment necessary for the voltage of the particular circuit. In order that the supply of water delivered from the apparatus may be absolutely sterile, or sterile to any required degree, it is necessary that there should be means of dealing with the various water pressures met with in different districts. To accomplish this purpose the inlet pipe is fitted with an adjustable valve of special pattern which can be readily set, so that when full open the delivery from the apparatus does not exceed the quantity specified, this, in the case of requirements being for absolutely sterile water, being 132 gallons per hour. The water enters the chamber formed by the outer cone with a swirling motion. At the top of this cone it overflows and finds an outlet at the bottom of the inner cone, up which it rises and flows out at the discharge pipe. The swirling motion is maintained during the complete passage of the water through the apparatus, in order that it may be thoroughly stirred up and all microbes presented to the action of the light, the water coming under its influence on two distinct occasions. Draining cocks are provided on the apparatus to enable it to be thoroughly emptied should circumstances arise whereby it would not be used for a considerable time. Not only does this system provide, in the case of the apparatus under discussion a continuous supply of sterile water available within five minutes, but the water or any other liquid that may be treated is unaffected as far as taste is concerned, as it retains all natural gases and salts in solution. The work of Prof. Henri, Dr. Helbronner, and Dr. Recklinghausen has also been directed towards the complete sterilization of milk, and this they have also accomplished. The apparatus for this purpose is more difficult to build than that for the treatment of water. Water is very transparent to ultra-violet rays; milk, however, is practically opaque to these rays, and special precautions have to be taken so as to bring it thoroughly under their influence.

A New Process for the Prevention of Coal-Dust Explosions.

The production of coal dust in mines is due to the shattering of the coal when it is separated from the face of the working by the blast. The current of air

which passes through every coal mine from one ventilating shaft to another carries the dust into every part of the galleries, which may extend for several miles. The distribution of the coal dust is further increased by the conveyance of coal in the mine cars, which usually move in a direction opposite to that of the air current, so that much dust is blown from them. The dust settles in the corners and on the projections of the walls of the gallery, and especially on the floor and the tops of the timbers.

If the mixture of air and suspended coal dust comes into contact with a sufficiently hot flame, a combustible gas is suddenly generated from the coal dust. This gas, known as methane, or marsh gas, is not explosive, except when it is mixed with air, in which condition it explodes with fearful violence. The shock of the explosion scatters in the air much of the coal dust which has settled on the floor and elsewhere, and the heat produced by the explosion distils from this suspended coal dust a fresh quantity of methane, which comes into contact with the flame. In this manner the explosion is propagated from point to point, often throughout the entire mine.

The possible means of preventing such extensive explosions of coal dust are confined to preventing the dust from rising in the air, and to disposing of the heat produced by the initial explosion so effectually that the further distillation of the coal dust and the formation of gas are prevented. The heat produced by the initial explosion may be consumed in the evaporation of incombustible liquids, distributed through the workings. The greater the quantity of such volatile liquid, and the greater the extent of surface exposed to the wave of explosion, the more rapid and effectual is the absorption of heat. The liquid used for this purpose at present is water. It is necessary to wet or sprinkle every part of the mine in which coal dust exists. This precaution is enforced by law in Germany and Austria, but not elsewhere, even in England, America, or France. Most of the water applied to vertical surfaces quickly runs off, and the little that remains adhering to the surface evaporates in a few hours. The effect persists a little longer on the floor of the gallery and other horizontal surfaces, but even the paste of coal dust and water that is formed on the floor soon becomes dry. Hence the application of water must be frequently repeated. Too frequent watering, however, is injurious to the operation of the mine. The water soaks into the porous rock and loosens it, causing danger of caving. In very hot mines, the rapid evaporation of the water produces an exceedingly damp atmosphere, which is very injurious to the efficiency and health of the miners.

The Kruskopf process for the prevention of coal-dust explosions, which has recently been patented in Germany, employs instead of water a viscous paste, of such chemical constitution that it does not evaporate appreciably under the influence of the normal air current, but evaporates rapidly when exposed to the heat of a small explosion. Owing to the adhesive character of the paste, it can be applied to all surfaces, horizontal, vertical, and inclined, and in about eight times the quantity which is possible in the case of water. The thick paste, furthermore, does not soak into the rock, and as it does not evaporate in ordinary conditions, it does not increase the humidity of the atmosphere. It has been proved by experiment that a coal-dust explosion, which in its nature is progressive, can be arrested by applying this mixture to the first hundred yards of the gallery, this distance being sufficient to cause the explosion to die out, owing to lack of explosive material. In the actual conditions of mining, the original ignition of coal dust takes place, in almost every case, at the face of the

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Gas light, inverted incandescent, A. E. Shaw 957,445
Gasolene engine, E. Vanderlip 957,278
Gate, C. M. Clark et al 957,745
Gear, reversing, D. W. McLaughlin 957,362
Gearing, P. Gaeth 957,763
Gearing, transmission, W. M. Parkison 957,795
Gimpole, W. R. Kales 957,216
Glass bottles, jars, and the like, machine for manufacturing, Knowles & Inman ... 957,349
Glass making machine, wire, A. J. Baldwin. 957,594
Glass, method of and means for annealing, F. Shuman 957,477
Globe for protecting mantles, A. P. Nelson. 957,790
Gopher exterminator, Duckett & Lloyd 957,458
Grader, road, T. E. Lyon 957,357
Grate bar, rocking, C. R. Kline 957,690
Grinding cams, machine for, M. A. Thiel ... 957,392
Grindstone truing or dressing apparatus, S. King 957,689
Hair, curing, G. E. Dyck 957,316
Hair curler and waver, W. F. Freeman 957,462
Hair grinding machine, C. P. Bossert 957,729
Hammocks, foldable stand for canopy, C. A. Berger 957,644
Harness, casting, I. Pasley 957,517
Harness shield, A. B. Harrell 957,771
Harrow, adjustable cultivating, W. S. Morgan 957,701
Harvester, corn, F. D. & A. D. Wilson 957,831
Harvester cutter, N. P. Lithander 957,428
Harvester cutter mechanism, L. T. Velen ... 957,280
Harvesters, elevator hood for, E. C. Mottert. 957,437
Hat brim edging, setting, and rounding machine, C. E. Sackett 957,519
Hat fastener, A. Straus 957,810
Hat holder, E. J. Guillard 957,770
Hay press, D. S. Beard 957,538
Hay presses, etc., condenser for, L. B. Wygant 957,291
Hay sweep, self-dumping, A. E. Davis 957,456
Hay tedder and mower, W. F. Schanzlin ... 957,628
Head gate, J. A. Taylor 957,448
Heat insulated receptacle, L. R. Steed 957,808
Heater. See Electric heater.
Heating running water, apparatus for electrically, G. & L. Fuller 957,667
Hinge joint, F. Wetteroth 957,528
Hinge, spring, F. H. Ellis 957,603
Hitching device, Lorse, E. B. Rolfe 957,380
Hod, G. W. Frost 957,604
Horn, reverberatory sound, W. A. Chapman. 957,654
Horse releaser, G. W. Huffman 957,340
Horseshoe, G. Limbach 957,691
Horseshoe, S. Orosz 957,707
Horseshoe calk, E. Huber 957,212
Hose, R. H. Brown 957,492
Hose carriage, garden, A. Low 957,569
Hose coupling, air, E. W. Shaw 957,385
Humidifier, J. W. Fries 957,197
Humidifier, E. Maxwell 957,430
Hydraulic jack, R. W. Baker 957,177
Impact tool, J. J. Padbury 957,708
Implement, combination, C. J. Livering 957,692
Indigo and making same, dichlor-dibrom, F. Julius et al 957,683
Inhaler, W. S. Doane 957,548
Inking ribbon winding apparatus, G. Binen. 957,542
Interlocking switch, A. C. Savage 957,262
Internal combustion engine, C. W. Higgs 957,336
Internal combustion engine, P. Daniel 957,657
Internal combustion engine, N. Metz 957,788
Ironing board, J. A. Bean 957,537
Ironing table, J. McGuigan 957,439
Jack. See Hydraulic jack.
Jig, W. A. Bradley 957,648
Journal bearing, B. L. Morrison 957,435
Journal box, Buss & Fairbanks 957,186
Key locking mechanism, P. H. Turley 957,481
Knitted sweater, M. A. Mueller 957,854
Knitting or weaving device, hand, A. Putman 957,711
Knob and spindle fastening, C. A. Berry 957,537
Label cabinet and moistener, C. K. Rush 957,378
Lacing, A. T. Holt 957,559
Lacing hook, A. Weigand 957,281
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Lamp, gas, A. Rector 957,476
Lamp, incandescent, A. Krzywiec 957,612
Lamp socket attachment, electric, H. E. Plunkett 957,371
Lamp socket, electric, F. E. Seeley 957,719
Lamp socket for reducing the light, regulating incandescent, E. H. Smith 957,806
Lamp support, resilient, A. Woodley 957,287
Lathe tool support, C. L. Libby 957,783
Leather machine, composition, F. Kukkuck .. 957,219
Level, plumb, A. A. Baumann 957,834
Leveler, field, G. M. Brand 957,732
Life prescrver and swimming machine, Lyon & Young 957,513
Lifter, F. W. Glymps 957,463
Lifting jack, J. M. Hawkins et al 957,333
Line casting machine, etc., W. G. Middleton 957,433
Line casting machine, J. R. Rogers 957,802
Link forming machine, J. F. Gail 957,203
Liquid elevating mechanism, M. J. Christensen 957,656
Liquid purifying machine, centrifugal, A. Ponten 957,250
Lock for windows and analogous devices, W. L. Deming 957,600
Locking device, hasp, E. A. Lindstrom 957,353
Locking means, closure, C. J. Ljunggren, 957,354, 957,355
Locomotive drive-box adjuster, M. F. Brennan 957,735
Logs or the like to hauling tackle, means for removably attaching, S. Ashdown ... 957,297
Loom, H. Cote 957,546
Loom, J. E. Lemyre 957,615
Loom picking motion, vertical, R. Abell 957,725
Magneto and battery switch for electric igniters, combined, Studnicka & Campbell. 957,270
Magneto electric generator, F. I. & B. P. Remy 957,714
Mail catcher, S. G. Staymates 957,581
Mail handling apparatus, M. M. Miller 957,255
Mail handling apparatus, Hargraves & Miller 957,330
Malting apparatus, C. J. Erdmann 957,664
Manure receptacle, J. Harrigan 957,772
Mast cap, B. D. Jensen 957,343
Master controllers, means for operating, E. G. Deucher 957,662
Medicinal compound, making, A. Garieson .. 957,204
Metals and the like from extraneous matter, apparatus for separating, R. M. Simpson 957,478
Meter. See Electric meter.
Milling machines, feeding device for, H. F. Kellemen 957,562
Mines, removing coal from, O'Toole & Eavenson 957,364
Mining machine, coal, Kurtz & Hochriter .. 957,510
Mixing and blending machine, H. G. Boughton 957,646
Molding machine, E. Killing 957,564
Motor control, E. F. W. Alexanderson 957,454
Motor driving mechanism, L. E. Underwood. 957,277
Motor regulator, pneumatic, T. Danquard ... 957,752
Motor starter, A. J. Burns 957,741
Motor starting device, electrical, H. Welchsel 957,587
Mowers, cutting mechanism for, J. S. Lynch 957,468
Mowing machine, automobile, C. G. Delano .. 957,660
Music binder and carrier, F. H. Duesler 957,459
Music turner, sheet, J. O. Phillips 957,370
Musical instruments, automatic player for, P. Welin 957,590
Net, J. F. Masek 957,618
Nose bag holder, C. H. Thompson 957,815
Nut lock, L. D. Frenot 957,504
Nut lock, H. Robinson 957,576
Nut lock, C. F. Clawson 957,746
Nut lock and screw socket for well drilling machines, A. G. Martin 957,429
Oil burner, V. F. Lassoe 957,614
Ores, treating, P. A. Emanuel 957,755, 957,756
Oscillographs, film holder for, Robinson & Miller 957,257
Osteopathic tables, swing for, W. E. Fogle .. 957,758
Oven, baker's, I. Stapo 957,479
Oven for tempering shoe shanks and other small articles, A. M. Moore 957,803
Oxidation of resistance conductors, preventing surface, J. T. H. Dempster 957,193
Package holder, F. Goble 957,767
Padlock, A. Nerhaft 957,705

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Classified Advertisements

Advertising in this column is 75 cents a line. No less than four nor more than 10 lines accepted. Count seven words to the line. All orders must be accompanied by a remittance. Further information sent on request.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. There is no charge for this service. **In every case it is necessary to give the number of the inquiry.** Where manufacturers do not respond promptly the inquiry may be repeated.

MUNN & CO., Inc.

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Inquiry No. 9076.—Wanted, the address of parties in Canada who could make a safety razor.

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Inquiry No. 9124.—Wanted, name and address of a company in Germany making a machine to manufacture a cement and asbestos shingle and building lumber.

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Inquiry No. 9136.—Wanted, the name and address of a skunk raising farm.

Inquiry No. 9137.—Wanted, a device that will braid leather strips for horse whips.

(*Concluded from page 428.*)

working, and the explosion is propagated thence through the gallery to the shaft. Hence, by applying this paste to a small region near each working, it is possible to confine the explosions to the workings themselves and to protect the rest of the mine, without the necessity of applying the same precaution through miles of galleries. This fact greatly reduces the expense and trouble involved in the method. Practical experiments in a Westphalian mine and in an experimental gallery have proved the correctness of the theory upon which this process is based. In the mine, the walls remained damp 3,000 hours after the application of the paste, but they dried up within six hours when water was used. The explosion of 75 grains of dynamite produces a sufficiently powerful flame to explode a mixture of coal dust and air when the walls of the gallery are dry, and for this reason the use of dynamite in coal mines is prohibited by law. The experiments prove that in a mine gallery protected by the Kruskopf process, more than five ounces of dynamite can be exploded in a mixture of coal gas and air without causing ignition. The experiment was repeated twelve times. After each blast, the quantity of coal dust in the mixture was increased by the addition of a fixed amount of dry dust, but the application of the paste or water was not renewed. In these conditions, when water was used, ignition took place after the third blast, but the first faint explosion occurred after the twelfth blast when the Kruskopf paste was employed. These conditions are very much more unfavorable than those which occur in the practical operation of coal mines.

Colors of Foods.

Of the strong addiction many consumers have for the use of foodstuffs that are secretly and highly colored for the market, the London Lancet says:

"For some not quite clear reason there are many people who look upon the brown egg as necessarily a new-laid one, and hence a fair demand for brown eggs has arisen, which is easily met not by the honest brown egg, but by the white egg which has been steeped in a dye which renders it visually indistinguishable from the real article. Again, when milk happens to be of a buff tinge, it is commonly held to be richer than white milk. Of course, nothing can be easier than to satisfy this preference for a milk of a creamy shade. White-looking butter is disliked as looking too much like dripping. The remedy is simple; it is artificially colored. Vegetables must be bright green to make them look fresh, the consumers of them being quite willing to ignore the fact that copper does not make them fresh or wholesome. On the other hand, curiously enough, bread must be white.

"It is, of course, perfectly natural to take color as a criterion of the dietetic value or flavor of food, and the attractive or unattractive appearance of food may make all the difference as to whether that food is, or is not, assimilated properly. The deceit which is practiced by artificially coloring food may thus serve a useful purpose, so long as the coloring matter is harmless, but as a rule the proceeding is an immoral one. It does not follow that because food is unattractive its value as a food is *nil*, while every form of sophistication is open to commercial abuse. A correspondent last week submitted to us a brown-shelled egg which on opening displayed a gorgeous red coloring scattered chiefly through the white. On analysis the coloring proved to be an anilin dye. The dye had deposited a nice brown on the shell, but an excess had permeated its pores, and, meeting with the slightly acid contents, was changed to a port-wine color inside. Until the egg was opened, therefore, it appeared perfectly attractive, but on opening it the zest to eat it quickly disappeared."

HALLEY AND HIS COMET

The year 1910 is destined to be one of the most famous in astronomical history, simply because Halley's comet has returned after a lapse of seventy-five years. Why not learn all about this wonderful comet and about comets in general by reading the following articles?

Scientific American No. 19, Vol. XCVIII. **Gas Phosphorescence and Meteor Trains.** An article in which the investigations of C. C. Trowbridge of Columbia University are described, showing that the after-glow produced from a vacuum tube resembles closely the effect produced in the sky by the passage of meteors.

Scientific American No. 6, Vol. XCIX. **The Mystery of Comets.** An article in which the famous comets of the last century are enumerated and described and modern cometary theories discussed.

Scientific American Supplement No. 1728. **Ancient and Popular Ideas About Comets.** Queer superstitions about the strangest of heavenly bodies.

Scientific American No. 7, Vol. CI. **Halley's Comet.** An interesting article by Dr. Alexander W. Roberts, in which the general history of Halley's famous comet is sketched with comments on its past appearances.

Scientific American Supplement No. 1705. **The Next Apparition (1910) of Halley's Comet.** An important article by H. C. Wilson, with a map giving the position of the comet relatively to the orbits of the planets from September 15, 1908, to July 13, 1910.

Scientific American Supplement No. 1632. **Halley's Comet.** An article by F. W. Henkel, F.R.A.S., which tells how Halley came to discover the comet which bears his name, and how mathematicians have plotted its orbit.

Scientific American Supplement No. 1770. **Edmund Halley.** A biography by J. E. Gore, M.R.I.A., of the man who dispelled cometary superstitions and popularized the law of gravitation.

Scientific American Supplement No. 1773. **Light Pressure and Comets' Tails.** An explanation of the vagaries of a comet's tail, by Arthur Stanley Eddington, F.R.A.S.

Scientific American Supplement Nos. 1788 and 1789. **Halley's Comet.** By George F. Chambers, F.R.A.S. The most thorough article which has thus far appeared on Halley and Halley's comet.

Scientific American No. 13, Volume CII. **Condensed Facts About Halley's Comet.** By H. W. Griggs. A few facts presented in condensed form for those who wish to follow the course of Halley's comet in the heavens. Maps showing the apparent path of Halley's comet through the heavens and the relation of the orbits of Halley's comet and the planets.

Scientific American No. 16, Volume CII. **Halley's Comet at its Brightest.** By Professor Henry Norris Russell. A simply-worded astronomical article telling how Halley's comet was discovered on its present return, when it will appear at its brightest, where to look for it, what it is composed of, etc.

Scientific American No. 18, Volume CII. **How to Make a Model of the Orbit of Halley's Comet, Showing its Relative Position to the Earth's Orbit.** Designed by James K. Lynch. By means of this model many of the phenomena of Halley's comet can be explained.

Scientific American Supplement No. 1772. **Photographing Comets.** By E. E. Barnard, of Yerkes Observatory. A practical article on how to photograph Halley's comet.

Scientific American Supplement No. 1778. **Halley's Comet.** An article in which the suggested observations proposed by the Astronomical and Physical Society of America are given, so far as photography and spectroscopic observations are concerned.

Scientific American Supplement No. 1782. **Halley's Cometary Studies.** Halley's own account of his investigations on orbits.

Scientific American Supplement No. 1785. **Halley's Comet as Seen from the Earth.** A table prepared by the distinguished Greenwich astronomer, P. H. Cowell, giving the ecliptic co-ordinates of Halley's comet to two decimal places at intervals of four days through an arc extending from one end to the other of the latus rectum of its orbit. The figures apply approximately to any return.

Scientific American No. 10, Vol. CII. **Could the Earth Collide with a Comet?** An examination of past comet scares and the general possibility of collision of a comet with the earth.

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